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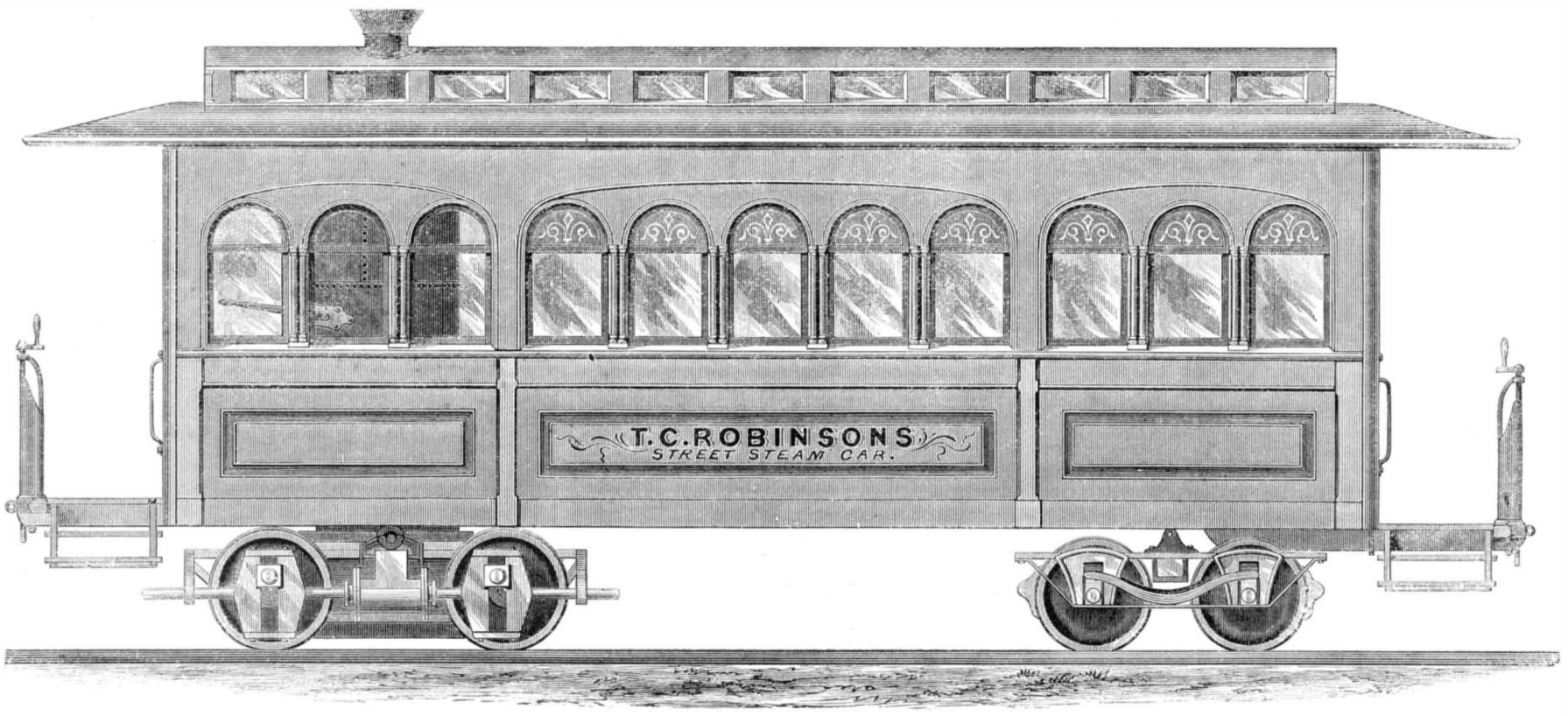
IMPROVED STEAM STREET CARS.

The long continuance of the pestilence which has made such sad havoc among the horses has demonstrated conclusively that inventions are needed for public conveyances, by the use of which we may become independent of equine labor. Among the difficulties, to be overcome in the application of steam to street car traction, is the propulsion of the vehicle around the sharp curves necessarily incident to the narrow streets of large cities; it is more particularly this obstacle which is claimed to be surmounted by the peculiar arrangement of machinery in the device herewith illustrated.



ROBINSON'S IMPROVED STEAM STREET CAR.

Briefly, the invention consists in making the boiler act as a transient bolt and, with the engine, to turn with the truck as the latter adapts itself to bends of the rails, so that the power is always applied in the most effective manner.

Fig. 1 shows a general view of the completed car, and by referring to the elevation and horizontal plan, Figs. 2 and 3, the following detailed description will be readily understood: A is the upright boiler, constructed so as to have a large heating surface, resting on and firmly secured to the truck frame, B. Above the lower portion of the boiler, and above the fire box, is affixed an inner transient ring, C, shown more

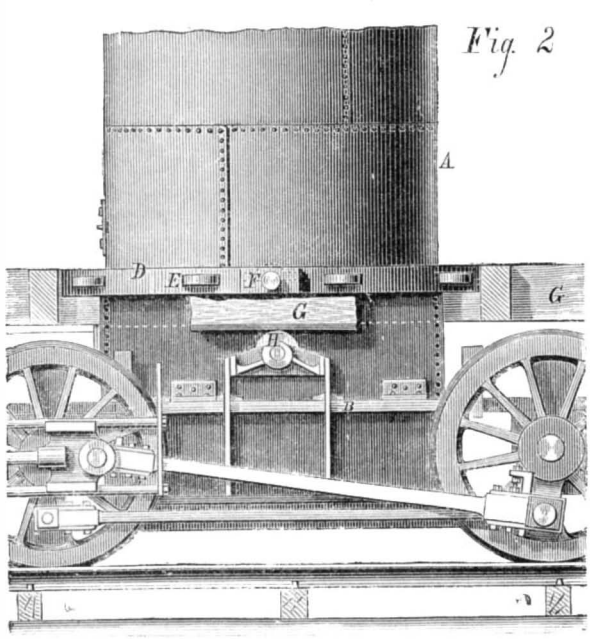


Fig. 2

clearly in Fig. 3. D is the outer transient ring in which are placed eight metallic cylindrical rollers, E E, held with their axes vertical. These project beyond the inner surface of the ring, D, and impinge upon the inner transient ring, C, so as to admit of the rotation of the former around the latter. Two trunnions, F F, on either side serve to support the ring, D, and at the same time allow it to freely oscillate in the bearings on the car frame, G. H, Fig. 2, is one of the ordinary car rolls, secured to the truck frame and sustaining the car frame, the latter being reinforced at the points of contact by a metal wear plate. The steam cylinder is not shown, but the piston rod is seen at the left of the engraving, communicating, by means of the crosshead in the guides, with the connecting rod which, with the parallel rod, actuates the driving wheels in the usual manner. It is clear from the above that the truck, and with it the boiler and engine, can freely turn, with the friction rollers of the outer transient ring, while the trunnions, F F, permit of the adaptation of the machinery to any angle of grade.

In Fig. 1, a somewhat different form of engine is exhibited, designed to present fewer working parts, and consequently to be less costly. The horizontal cylinders are placed almost centrally between the driving wheels, their piston rods connecting with the la-ter directly by mean s of the slotted guide pieces. The driving wheels communicate with the guide pieces by their crank pins, which are receivd and work in the longitudinal slots. At the rear of the supporting frame is placed a condensing apparatus, which is used in connection with the engine.

The cars may be constructed of any dimensions to accommodate a required number of passengers. The advantages claimed are simplicity, compactness, strength, utility, and cheapness. Hard coal, it is stated, may be used as fuel at an expense of one third less than that of employing horses.

We are informed that the invention has been in successful operation on the Portland and Gorham Railroad for some time past. It is covered by three distinct patents. Further information may be obtained by addressing T. C. Robinson, & Co., care of the Sanborn Machine Company, No. 78 Duane street, New York city.

The Metropolitan Museum of Art.

There at last is a fair prospect of the permanent establishment in this city of a museum similar to the South Kensington museum in London: a collection of works of art, original and copies, free to the study and inspection of the public. A site for the building has been obtained, on the corner of 79th street and Fifth avenue. In addition to the fine paintings which have been placed in the present temporary gallery, duplicates of the best specimens of the splendid collection in the above mentioned English museum are to be added. We also learn that the celebrated collection of antiquities made by General Di Cesnola, our late consul at Cyprus, has been purchased. It is believed that these Phœnician relics are the first that have been discovered of that early maritime people, and the various specimens will materially aid specialists and antiquaries in furnishing clearer pictures of Eastern life and manners, three thousand years ago.

A central building will first be erected, to which additions will be made as they are required. In the main part there will be four galleries, each ninety-five feet long and lighted from above. The ground floor will be an open court, surrounded by gardens and fountains and affording ample room for the statuary vases and monuments.

We note with much pleasure the enterprise with which this plan has been advanced Museums such as this go far toward the education of popular taste, besides affording to artists and all workers in decorative art the most faultless models for imitation.

How to Clear Muddy Water.

Experiments have been made in Australia with the view of finding means of clearing the muddy waters of reservoirs. The purest waters are, as a rule, those in which mud and organic matter remain longest in suspension. Water stood in a bottle in the laboratory for more than six months without depositing the clay held in suspension. The soluble matter was chiefly chloride and carbonate of sodium, and was present in only small quantity. Another water stood for three months with like results. Both waters contained more clayey than organic matter, and were rendered clear by an addition of chloride of calcium. One part of this salt in 1,000 of water cleared it in less than an hour; 1 part in 2,500 of water, in five hours; 1 part in 5,000, in six hours; 1 part in 10,000, in twenty-four hours. When, however, the water contained more organic matter than inorganic or clayey matter in suspension, the calcium salt did not act so readily, but was aided by an addition of lime; as little as two grains of quick lime cleared a gallon of water in twelve hours. Three or four

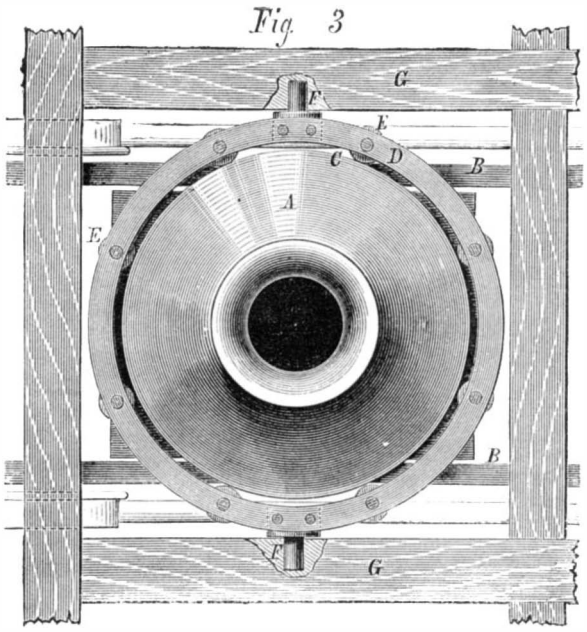


Fig. 3

grains of alum or chloride of aluminum answered the same purpose; but there are many objections to the use of alumina salts.

LOOK TO YOUR JOURNAL BOXES.—A block of grain warehouses, including a large elevator, were destroyed by fire in Brooklyn, N. Y., November 20 The fire is supposed to have been cause d by the over-heating of a journal box from friction. Loss, half a million of dollars.

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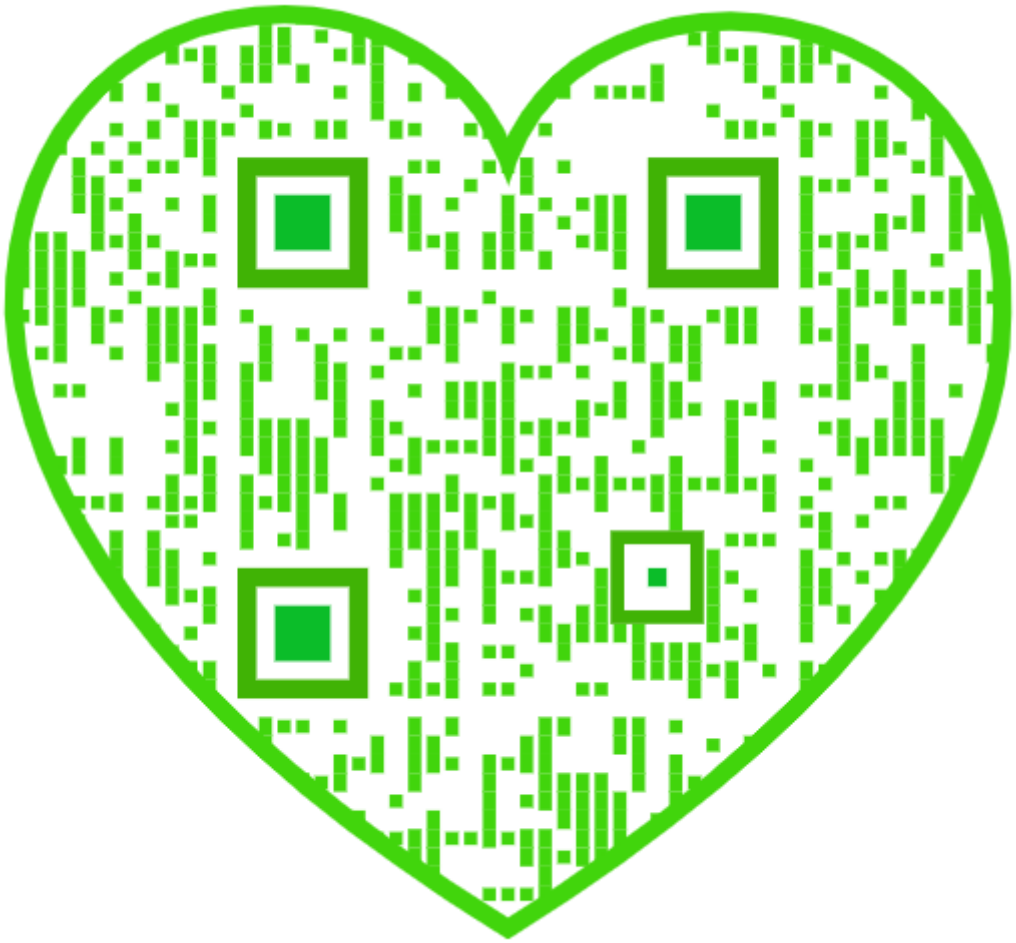

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OUR FIVE HUNDRED THOUSAND DOLLAR COMMISSIONER TO VIENNA.

Another communication from the United States Commissioner to the Vienna Exposition, designed as a refutation of the facts presented in our editorial of last week, will be found elsewhere in this issue. It is devoted to the pointing out of certain errors in our article; and exception is first taken to a circular mentioned therein. After quoting the words of the publication, our correspondent makes the positive assertion that it never issued from his office "nor does it purport to be." We have but one comment to make upon this remarkable statement, which is that General Van Buren has evidently not taken the trouble to read the document in question; if he had, he could not with truth publish such a denial. The circular comes apparently from the Advisory Committee of Group 13—a body supposed to be appointed by the Commissioner—and concludes with these words: "Manufacturers of machinery *will address T. B. Van Buren, Commissioner of the United States*, 51 *Chambers street*, or the undersigned" (Professor Thurston, of the Stevens Institute). So far as our perceptive faculties extend this *seems* to come from General Van Buren; and even were his name omitted, the fact of Professor Thurston—who, by the way, is to be addressed only in the alternative—being his agent renders the Commissioner legally responsible for such official emanations.

"In all my statements upon the subject," our correspondent continues, "I have endeavored to give a careful and true account of what has been done," etc. Then we must sympathize with the General in the unfortunate failure of his well-meant efforts in this direction. In the sentence immediately preceding the words above quoted, he makes, innocently we are sure, assertions which are wholly without foundation, and on which he further enlarges in the succeeding paragraphs of his letter. We are informed: First, that the Austrian government has made concessions. Second, that a valuable trade mark treaty has been effected, which is strong evidence of Austrian good will. And third, that exhibitors in the Vienna Exposition are protected by a certificate which operates as a full patent.

What the "concessions" are we have yet to discover. As for the trade mark treaty—which, in connection with everything else relating in any way to Austria, seems to be regarded by the Commissioner through rose-tinted spectacles of the deepest hue—being any proof of Austrian good will or affection for this country, is sheer nonsense. The provisions of our law on the subject of international trade marks make the matter one of simple reciprocity; that is, we guarantee to protect the trade marks of a foreign nation if that nation will in return engage to do the same by us. The offer is open to the world. Large numbers of Austrian manufacturers export goods to the United States, and they want protection here for their marks; consequently it was to Austria's direct interest to take advantage of the treaty, and she did so.

As to that exposition certificate, we have repeated again and again, and proved our assertions beyond all peradventure by the best evidence, that it does *not* ensure one *iota* more of security against the infringement or piracy of inventors. It is simply an enactment, as a Vienna correspondent of the New York *Herald* truly states, "to allow inventors to bring their inventions to the Exposition and exhibit them and take a patent under the old law before the 31st day of December," after the show is concluded. It is manifestly *not* a patent, nor can we see how any one can trace in it the remotest resemblance to such; it may be refused by the Director General to any inventor or exhibitor *without appeal*; and it merely places the limit of the time during which an invention may be introduced into Austria without being patented at one year. It does not modify the obnoxious laws, nor is it anything beyond a decoy to deceive persons who, like the Commissioner, are inexperienced in Austrian patent law practice. These facts seem perfectly self-evident, and we cannot understand by what course of logic General Van Buren expects to persuade himself or any one else endowed with reasoning faculties to the contrary.

Our correspondent remarks that the opposition of a portion of the press, which by the way includes three of the New York dailies beside ourselves, will postpone or prevent the success of his endeavors in Washington. We hasten to say that such is precisely our intention, just so long as he persists in manœuvring to obtain any such exorbitant sum as half a million of dollars, the greater portion of which, according to his own showing, will be needed to pay his expenses and those of his assistants in Vienna. Now, in regard to these assistants: General Van Buren flatly denies that he has sixty-five sub-commissioners, or whatever they may be termed, or even one fifth of that number. The General should not rely so implicitly upon his memory. We have before us a circular: date November 15, 1872: signature T. B. Van Buren: contents, a description of the importance of the Exposition and a list of an advisory committee (of which the Hon. S. B. Ruggles is Chairman) composed of *thirty* gentlemen. Thirty is more than one fifth of sixty-five. The last mentioned number, let us explain, we specified under the impression that there were but thirteen gentlemen in the above mentioned advisory committee, coupled with the assurance of a member of said body that each person appointed four assistants, which made up a sum total of sixty-five. Now, however, it appears there are twenty-eight advisers, not including the chairman and secretary; consequently, instead of there being sixty-five officials, there are now one hundred and forty-three. Was the above described circular published by General Van Buren or by an irresponsible somebody? Or is it a forgery? Or were we grossly deceived by the gentleman who informed us that the Commissioner not only appointed but requested him to serve on the advisory committee? Or does our correspondent now mean to repudiate the whole document, and with it the gentlemen therein named? After thus disposing of our "error," the General proceeds to observe that the few persons he has appointed are scattered about the large cities distributing programmes, etc. We were not aware that New York had lost so many of her prominent citizens, or that such gentlemen had undertaken agencies for the Vienna Exposition; for we recognize very nearly all of the thirty advisers as well known residents of the metropolis.

The Commissioner closes his communication with the suggestion for the government to pay all the bills generally, and especially, of course, the expenses of a certain number of commissioners—said number, we naturally infer, is thirty. Now, as there is no earthly reason why one set of volunteer employees should be paid and not another, the hundred and odd assistants will doubtless expect to come in for a share of the spoils; so that the half a million of dollars will go but a short distance, and the unfortunate exhibitors in the end bid fair to be of very secondary consideration.

ASTRONOMICAL NOTES.

Under this heading, we publish in another column a variety of interesting astronomical information furnished for our readers by Professsor Maria Mitchell, Astronomer of Vassar College. From these notes, it appears that the surface of the sun has for some time past exhibited the presence of large numbers of dark spots, the movement of which across the great luminary attracts the attention of observers. These spots may now be seen through an ordinary opera glass, care being taken of course to protect the eyes by the interposition of proper colored media.

The precise character of these sun spots is still unsettled. Although to the eye of man they appear as dark or black bodies, it is certain that they are in reality very luminous; but they are less luminous than the surrounding portions of the sun's surface, and hence they appear dark to the eye, just as the most brilliant gas light appears black when interposed between the eye and the sun. The prevailing opinion based upon the spectrum observation, is that the spots are composed of thick luminous masses or clouds of gases of various substances, among which are found iron, calcium, barium, magnesium, sodium, hydrogen, aqueous vapor. Some observers think the spots have a semi-fluid consistency, while Zöllner regards them as a kind of slag or scoria.

The positions and appearances of various heavenly bodies, to be seen on these clear winter evenings, as mentioned by our correspondent, will be read with general interest.

A REMARKABLE TEST PLATE.

One of the devices used by microscopists to test the correctness and power of their lenses consists of a glass plate, upon which lines of exceeding fineness are engraved by the diamond. For this purpose a small ruling machine is used, all the parts whereof must be made with unusual nicety. In Europe the test plates made by M. Nobert, of Prussia, have long been celebrated for the fineness of their ruling, and in this country those of Mr. L. M. Rutherford, of New York city. The expense of the best Nobert plates has been $100 each, and the finest rulings heretofore done have been 120,000 lines to the inch. There are few microscopists who have ever been able to see or resolve the lines of these plates owing to the difficulty of properly lighting the plate. Dr. Woodward, of the United States Army, is among those who have succeeded in doing so. He has not only seen them but has photographed the lines.

Professor F. A. P. Barnard, President of Columbia College, in this city, has lately received from Nobert a new test plate, ordered some two years ago, at an expense of $200, which surpasses in the fineness of its ruling anything heretofore produced. It is a slip of glass 3½ inches long and 1¼ inches broad, in the center of which the unassisted eye may discover what appears to be a mark perhaps the fiftieth of an inch in width. But when placed under the microscope this mark is found to be composed of a great number of parallel lines. The plate, in fact, contains twenty test bands, that is to say, twenty series of lines. Each series contains such a number of lines as will occupy or more than occupy the field of view of the microscope. The fineness of each band or series varies from a ratio of three thousand lines per square inch up to *two hundred and forty thousand* lines per square inch; this last band contains double the number of lines ever before ruled on a test plate. Nobert is said to have remarked, on sending this plate, that if the microscopist, on seeing these lines, found that they were not sufficiently fine, he would engage to rule a still finer plate. When Professor Barnard succeeds in seeing them, doubtless he will let us know.

ITALIAN INDUSTRIAL PROGRESS.

With the exception of 10,000 tuns of refined sulphur derived from the Roman mines, all of that material obtained from Italy comes from Sicily, and is exported in a crude state. The total value of the sulphur is nearly $5,200,000, not including the export duty of two dollars per tun, which is paid by foreign buyers. There are about 19,000 workmen engaged in this industry, 5,000 miners and 14,000 operatives employed in transportation, refining, etc. The carrying of the sulphur from the mines to ports of embarkation furnishes labor for 20,000 additional workmen.

The iron drawn from Italy and the articles made therefrom represent annually a value of $4,000,000. The production of the founderies does not exceed 22,000 tuns. The total product is but one fifth of the entire amount consumed in the country.

Lead and zinc are derived almost exclusively from Sardinia. Their extraction requires 10,000 workmen, and quantities to the value of $2,400,000 are produced. The lead ore is argentiferous but the silver is found in extremely small amounts. The zinc is exported to Belgium and England. The quantity obtained yearly reaches 60,000 tuns.

THE FAIR OF THE AMERICAN INSTITUTE.

The American Institute Fair formally closed on the 20th of November last. Mr. N. C. Ely, Chairman of the Board of Managers, delivered the concluding address, stating that the Exhibition had been on the whole successful, though at one period its receipts were seriously impaired by the stoppage of public travel through the horse disease. The usual congratulatory remarks to managers and exhibitors were pronounced, after which such premiums as had been awarded were published. Medals of special award were lavishly distributed on almost every prominent article in the Fair. Several recommendations, we learn, have been made for the Grand Medal of Honor, but no award of this distinction has as yet been made. As compared with previous exhibitions, the Fair has been fully up to the standard in the variety of entries and important inventions presented, though it was hardly expected that such would be the case, owing to the excitement of the late elections directing public attention into other channels.

As there still remain a few articles of merit to be noticed, most of which were recent additions to the Fair, we give brief descriptions of those which seemed to us most interesting.

ELECTRIC CLOCKS

were exhibited in various styles by Messrs. Himmer and Au tenrieth, 371 Pearl street, New York. The chief obstacle which inventors of electric clocks have heretofore had to encounter is the inequality of the electric current, which even from the most constant battery varied with the condition of metals, temperature, strength of solutions, etc. To avoid this difficulty, Mr. Himmer conceived the ingenious idea of combining the constant action of a weight with the electric current, so that, in his own words, "in place of driving the pendulum by the direct action of the electric current, when passed over helices of wires and charged by magnetic attraction, a little weight, of not more than half a grain, is used, which, by its descent, drives the pendulum, and which, after every oscillation, is lifted up to its former position by the electromagnetic power of the battery."

The clock is in fact wound up after every oscillation, the battery lifting up the weight a distance of only some quarter of an inch. As the latter is very light, an extremely small electric power is wanted to accomplish this labor For this purpose Mr. Himmer has invented the constant battery described in a recent number of this journal. Another advantage of the application of electricity to clocks is the possibility of moving the hands of any number of clocks through the oscillations of a single pendulum. This is effected by attaching, to the arbor of the second hand of the clock, a notched cam or break circuit, whereby, once during every revolution of the arbor or at any interval desired, connection is established and broken with any number of other clock works.

THE WOODBURY BRUSH MACHINE,

one of the most remarkable and ingenious inventions that has ever come under our notice, has been exhibited in actual operation. This device was fully explained in a recent number of our journal; its operation consists in inserting the the bristles in solid brush backs in such a way that it is impossible to remove them. During the tests made before the judges, the machine made tooth brushes and coarse scrubbing brushes with equal facility, placing the bristles in ebony,

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ivory, and wood with wonderful accuracy. It received the highest praises in the official report of the experiments, and well merits, if it does not receive, the best award in the gift of the Institute.

THE CHAMPION SPRING MATTRESS,

manufactured by Messrs. F. C. Beach & Co., 141 Duane street, New York, deserves notice as one of the best of the many entered for exhibition. It is composed wholly of metal, no wooden slats or frames being used. It is therefore very durable. Helical steel springs are used, so connected as to make a perfectly elastic soft and level bed. This mattress is remarkably light, its largest size weighing but twenty-five pounds, and it rolls up like a blanket, is easily moved and transported. Just the thing for housekeepers. The springs are inlaid with a waterproof fire enamel so that the bed is serviceable in any climate.

THE SAWYER PLAITING MACHINE

will doubtless prove a valuable invention to manufacturers of shirts and similar garments made with numerous plaits. The device consists of two cylinders, in the lower one of which a heated iron bar is placed. As the cloth is passed between, a sharp steel blade is caused to rise and form a plait or fold of any desired width, which is smoothed perfectly flat by the action of the rollers.

THE AMERICAN WOOD PANELING MACHINE

is a novelty that cuts panels in hard or soft wood with remarkable accuracy. The board to be operated upon is placed on a table, which is so arranged as to be easily movable in any direction. On the plank, by a simple means of adjustment, are attached pieces which give shape to the panel and which guide the cutting instrument. The latter works vertically and its operating blade resembles an auger point, only constructed somewhat on the principle of solid cutters for sash molding; so that, when caused to revolve and pressed down upon the board, which is moved under it, it cuts a molded groove. By allowing the instrument to remove certain portions of the wood, either a raised or a sunk panel may be made, leaving nothing further to be done beyond smoothing the work by hand in the ordinary manner.

NEW PLAN FOR A LOCAL FIRE DEPARTMENT.

The town of Easthampton, Mass., has an excellent plan for a local fire department, which may be advantageously copied by communities who cannot raise funds sufficient to introduce regular water works, or do not desire to maintain steam fire engines in connection with a reservoir. In the above mentioned town, the Valley Machine Company, there doing business, are building a large bucket plunger steam pump with a capacity for discharging 500 gallons per minute, from which pipes have been laid through the streets, connecting with hydrants placed at suitable distances apart. These pipes are always kept full of water by means of a small auxiliary pump, and in addition to their fire purpose serve to supply the hotel of the place. The large pump, which, we may here add, was invented and patented by William Wright, for many years master mechanic in the Woodruff & Beach Iron Works at Hartford, Conn., is to be connected with a boiler in one of the manufacturing establishments of the town, where steam is always kept up, so that a stream of water can be obtained in a moment, in case of fire, by merely coupling the hose to a hydrant.

The citizens of Easthampton, in lieu of devoting a large sum yearly to the maintenance of a fire department, in addition to defraying the expense of the above described machine, set aside an amount annually for the extension of the pipes, so that each year a broader area is protected.

SCIENTIFIC AND MECHANICAL POSSIBILITIES.

Gas wells in various localities indicate that immense deposits of coal oil and petroleum exist in the earth, which may be at great depths; and New England may yet count it among her treasures, and large and enduring deposits, which few now dream of, be found. We may burn it for fuel as well as for illumination; by its use steam boats may cross the ocean, and locomotives fly by its aid. We are just beginning to learn the power of this new servant that man has awakened from the sleep of ages. The country also abounds in limestone, sandstone and bituminous shales, which, by scientific and mechanical aid, may afford an almost never ending supply of this wonderful material.

And notwithstanding the seemingly advanced state of the means of transportation, it is inadequate to the present wants of man. Steamboats and railroads do not even meet the wants of our own country. New England and the Middle States want Western and Southern products; and, *vice versâ*, the West and South want Eastern products at cheaper rates. Can the possibility of aerial navigation be doubted? Every year is bringing us nearer to the practical solution of this great problem.

If a light motive power is required, science may yet discover a cheap method of separating aluminum from our clay, some of which contains as much as 30 lbs. of this most wonderful material to the tun. This metal is three times stronger than steel and as light as chalk. On the very surface of the earth, we daily walk over a material from which the machinery for a motive power may be constructed of about one tenth the weight of iron or steel. In the oxygen of the atmosphere is abundant fuel which may yet be used to rarify the air for a motive power; other powers also exist in Nature, which will, no doubt, yet become the servants of man. One discovery opens vast and expansive avenues, leading to unexplored regions where munificent creative Nature hold in store rich treasures which the scientific hand may drag from her dark *arcana*.

He who engages his mind, his time, or his fortune in the development of scientific means for bringing forth from Nature's rich stores that which will add to the enjoyment, happiness and comfort of man is entitled to the greatest honors that can possibly be bestowed by an appreciative world.

J. E. E.

REMARKABLE MAGNETIC STORMS AND AURORAS IN EUROPE.

On October 14 and 15 last, a brilliant aurora borealis was observed in Paris. At Brest, at 10h. 34m. on the evening of the 14th, the magnetic storm burst. M. Sureau, who was at the time closely watching the needle of the galvanometer, which was gently oscillating between 2 and 3 degrees, saw it leap suddenly to 25 degrees. All the working apparatus was suddenly attacked, and all the sounding machinery instantly set in motion, making a deafening noise, while the electro-magnets were strongly excited. It was also remarked that the currents acting on the telegraphic wires of Brest were directed from west to east. During October 16, 17 and 18, the disturbances in the telegraphs became general throughout France and probably through the greater part of Europe. The telegraphic service in France was thrown into complete disorder, necessitating the forwarding of the telegrams for Italy through the mails. These perturbations, which lasted three days, were, says *Les Mondes*, of a totally different character from those of the 14th and 15th of the same month. They were nothing more than instantaneous contacts, derangements analogous to those produced by mixing the wires; there were no longer the prolonged contacts and well defined waves which accompanied the polar auroras.

With the disturbances throughout nearly the whole of Europe appeared violent storms with thunder and lightning, which, in connection with a great barometric depression in Spain and in the southwestern portions of the continent, together with an exceptionally chilly temperature, have been remarked as extraordinary cosmic phenomena.

STEAM TRACTION.

Professor R. W. Thurston, of the Stevens Institute, delivered recently an interesting address before the Polytechnic branch of the American Institute. He showed conclusively that for heavy truckage on common roads and streets, the steam traction engine may be used with an economy of seventy-five per cent over the cost of employing horses. In other words, steam carts can be employed at only one fourth of the present expense of horse carts. During the subsequent conversation, the subject of steam street cars and carts was talked over, and one of the members expressed the opinion that the reason why horses were frightened at the steamers was because the animals were superstitious. They saw the machines were without horses, and instantly assumed that the movement was the work of the devil.

SCIENTIFIC AND PRACTICAL INFORMATION.

THE ELLIS VAPOR ENGINE.

A correspondent signing himself "Diameter," takes exception to a sentence in the letter signed J. A. H. E., on page 244 of our current volume, in which the writer says: "The theory that heat is converted into power in an engine, and thereby used up and lost, does not prove true in practice, as the experiments of Mr. Ellis fully show." J. A. H. E.'s pen must have slipped a little here. The Ellis engine is intended to save some of the heat that would otherwise be wasted. The difference of pressure—that is, of the heat—between the steam in the first cylinder and the bisulphide vapor in the second is a measure of the work done in the first cylinder, and the abstracted heat is converted into work. But as long as any heat remains in the vapor, more work can be obtained from it; and when all the heat is gone, no more work can be obtained. There is nothing in the Ellis engine to combat the theory of the convertibility of forces, and we do not think J. A. H. E. would maintain that there is.

DRYING AND COLORING NATURAL FLOWERS.

When blue or violet flowers are exposed to the smoke of a lighted pipe or cigar, a very surprising change of color takes place, the flowers becoming a magnificent green resembling Schweinfurt green, without any injury being done to the form of the flowers; and the deeper the original color, the darker is the green. Candy tuft (*Iberis umbellata*) and night violet (*Hesperis matronalis*) take an especially beautiful color. This phenomenon is caused by the small quantity of ammonia present in tobacco smoke, which converts blue and violet into green in the same manner as solutions of the alkalies do. The smoke blown from the mouth will not produce the same effect, because the ammonia is absorbed by the saliva of the mouth. Unfortunately this beautiful appearance does not last long; the flowers which have been exposed to the slightly increased temperature of the burning cigar wilt and become of a dirty yellowish brown color. The experiment is much more satisfactory when weak ammoniacal gas is used. To do this, insert the flower in the tube of a glass funnel in such a manner that the rim of the funnel projects an inch above the flower. A few drops of ammonia are dropped on a plate, and the funnel containing the flower is inverted over it; in a few minutes the most beautiful change of color takes place. Nearly all blue, violet, and light carmine flowers are changed to a magnificent Schweinfurt green. Dark carmine red pinks are colored black, the carmine flowers of *Lichnis coronata* become dark violet, while all white flowers turn sulphur-yellow. Variegated flowers show the most striking changes of color, the white petals turning yellow, and the red petals on the same flowers, green. If red fuchsias with white calices are treated with ammonia, the calix becomes yellow, and the red part, green and blue. After the change of color has taken place, put the flowers at once into fresh water, and they will retain their beautiful colors from two to four hours, according to the amount of ammonia taken up. Gradually, however, their former colors return, the green leaves passing through blue to the original color, without wilting. Lovers of flowers can in this way produce, as it were by magic, a *flora* which does not exist in Nature.

If the ammonia be allowed to act on the flowers for one or two hours, they acquire a permanent dirty chamois color, without wilting or losing shape, even when dried. Asters, which have no odor, acquire a sweet aromatic odor as soon as saturated with ammonia.

To give blue, violet, or red asters a beautiful red color, so that they can be dried to be used in winter for wreaths, it has heretofore been customary to immerse them in, or sprinkle them with, dilute nitric acid. This method did not produce very perfect flowers, because the wax in the petals of the flower prevented the acid attacking them equally. This produces irregularity in color, and when dry the form of the flower is also irregular, so that many of them are wasted, being unfit for use. These disadvantages are overcome by using hydrochloric acid vapors. Any wooden box can be used for the purpose. The box should first be provided with strings on which to hang the asters, and a piece of glass inserted on opposite sides of the box to watch the change of color. Then suspend the asters by pairs or double pairs, with the stems tied together, and in such a manner that the flowers hang down. On the bottom of the box are placed one or two plates of ordinary hydrochloric acid, according to the size of the box and number of flowers, and the box is closed. Small flowers are evenly colored in two hours, larger ones require four to six hours exposure to the acid. Red and blue asters become carmine red without injury to their form. It is necessary to examine the box from time to time, and to remove the flowers as soon as the change of color is completed.

After being removed from the box, the flowers are suspend ed in a similar manner in an airy but shaded room to dry. When dry, they are preserved in a dark dry place.

PURIFICATION OF DRINKING WATER.

Some time in 1871, Dr. Bischoff, Jr., took out an English patent for removing organic matter from drinking water by using a filter of spongy iron prepared by heating hydrated oxide of iron with carbon. This iron sponge not only purifies the vilest sewage water from organic matter, but also precipitates any copper present. It has, however, been found to possess this disadvantage, that the water so purified contains so much iron that it soon turns brown, and the iron separates in a copious precipitate in the form of the hydrated oxide of iron. This threatens to limit the usefulness of the discovery.

SOLDERING IRON AND STEEL.

Dr. Sieburger publishes the following methods for soldering iron and steel:

If large and thick pieces of iron and steel are to be joined, sheet copper or brass is placed between the perfectly clean surfaces to be united, which are then tightly wired together. The joint is covered with wet clay free from sand, and dried slowly near the fire. When the mud is dry, the joint is heated by a blast to a white heat and cooled, suddenly if iron, slowly if steel. When brass is used, it requires less heat, of course, than copper.

For objects of moderate size, hard brass solder is made by fusing together 8 parts of brass and 1 part tin. Soft brass solder is composed of 6 parts brass, 1 part zinc, and 1 part tin.

For soldering small iron or steel articles, a hard silver solder composed of equal parts of fine silver and malleable brass is used, the mass being protected by borax. Soft silver solder differs from this only in the addition of $\frac{1}{16}$ part tin.

Very fine and delicate articles are soldered either with pure gold or a gold solder composed of 1 part gold, 2 parts silver, 3 parts copper.

A CHEAP FIREPROOF SAFE.

A correspondent sends us a suggestion for a cheap fireproof safe, which he proposes to construct as follows: "Sink a well, six or eight feet deep, in the basement, and place in it a round or square boiler tube which should rise a little above the surface. In this tube place another, a little smaller and shorter, so that there will be space (at least two inches all round) between the two. Close the inner tube with a watertight door packed with a soft rubber ring, and let water fill the space and flow over the inner tube. Let there be an inch pipe from the bottom of the inner tube, leading under the walls of the building and rising out of the ground. The external end of the pipe will serve to admit air to the inner tube, and should be covered to prevent the admission of dust. Let a waste pipe lead from the top of the outer tube, and arrange a cock so that the water over the door of the inner tube may be drawn off. Fix two guide rods to the inner tube, and let an elevator with shelves pass up and down the rods, to lower your books into the well. The elevator when loaded can be counterbalanced with a weight. When you have placed your books on the shelves and lowered them into the well, close the door and let the water flow in till the whole is covered. As long as there is water in the outer tube, the inner one cannot become hotter than 212°. It will be easy to arrange so that the water can be turned on or let off without descending to the basement."

THE steam canal boat Success, built on Captain Goodwin's plan, illustrated not long ago in the SCIENTIFIC AMERICAN, lately arrived in this city from Buffalo, after a profitable and successful trip—her first voyage.

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IMPROVED STEAM ENGINE.

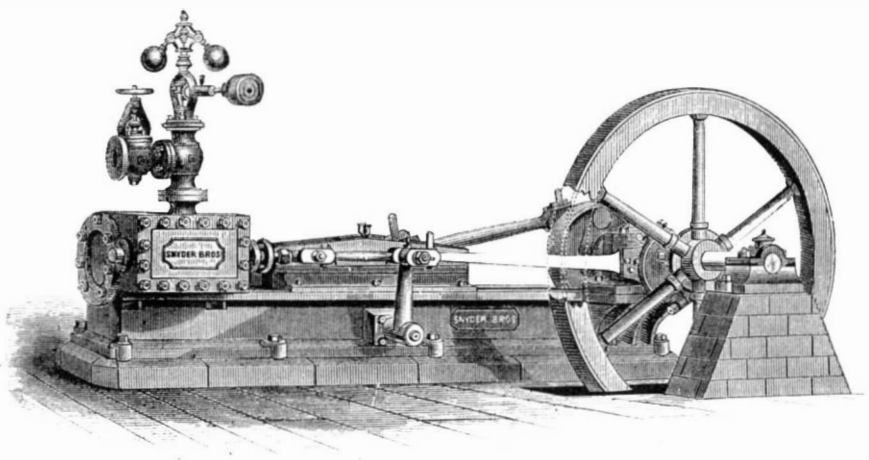
The steam engine of which we present an illustration is built for the purpose of being carried far from machine shops and skillful engineers; and the manufacturers have spared no pains or expense to get up an engine that will lessen the care of the engineer, and reduce the liability of derangement to the lowest figure.

The parts most exposed to wear are made of steel and bronze, and the balance, of the best hammered and cast iron. All the wearing parts are made very large, so as to present a large amount of surface to do the work.

It is a plain straightforward horizontal steam engine, without independent cut off, the introduction of which would complicate the engine and render it more likely to get out of order. But those which have been in use have exhibited an economy in the use of steam that many of the more complicated independent cut off engines cannot excel.

An idler rock arm is put in between the eccentric rod and the valve steam, so as to allow the engine to be run at a high rate of speed, and avoid all springing which so seriously interferes with the motions of the valve on high speed engines as commonly built.

The fly wheel with wrought iron arms is acknowledged to be the cheapest in construction and has the greatest proportion of its weight in the rim just where it is most effective. The defect of those heretofore made has been that they were not stiff enough sidewise. This fault Messrs. Snyder Brothers have overcome by spreading the arms or spokes apart (sidewise) at the hub, so as to brace against each other.



SNYDER BROTHERS' STEAM ENGINE.

The second difficulty in ordinary wheels is the shrinking of the cast iron away from the arms and leaving them loose. This they have also overcome, and the arms of their wheels are solidly welded to the rim and hub; or, when preferred, they put a pulley fly wheel on their engines.

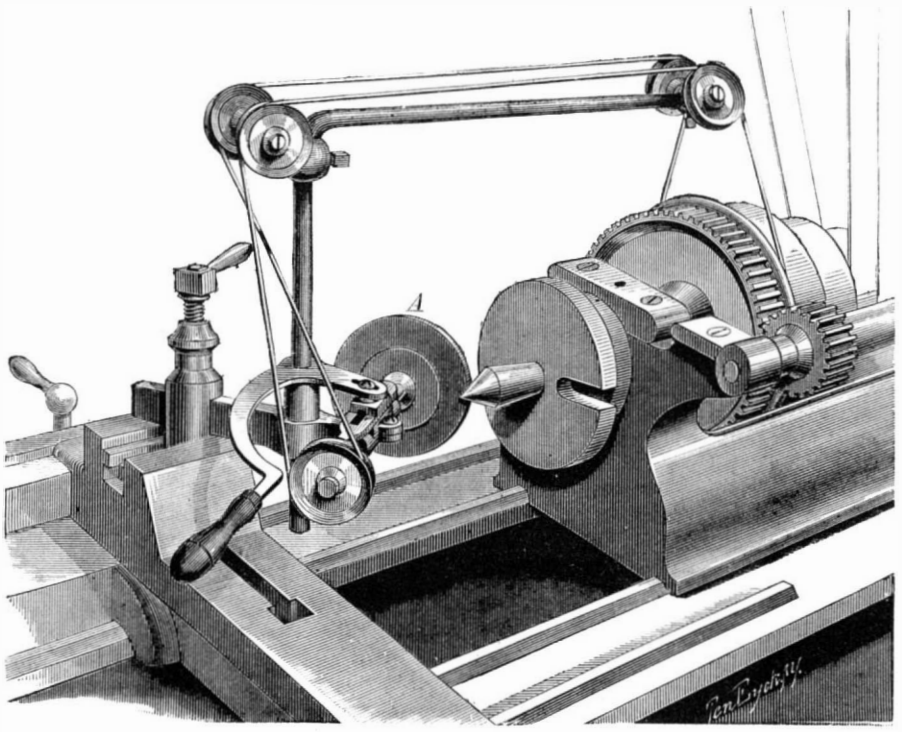
The piston is self-packing and the manufacturers state that it requires no care. One of them, 22″ diameter, has, they state, been running in a saw mill for six years without repairs or care, and the interior of the cylinder to-day is as bright and smooth as a looking glass.

These engines are built to run at a high rate of speed, so as to develop as great an amount of power at as small a cost as possible; and to render this speed admissible, every part is finished with the greatest accuracy and made of the very best material. For further particulars address Snyder Brothers, Williamsport, Pennsylvania.

LATHE CENTER GRINDER.

It is a common practice to leave the revolving or "live" centers of turning lathes soft, in which condition they are exceedingly liable to bend or indent and, by producing imperfect work, cause serious defects in the turned portions of machinery. The device herewith illustrated is designed to grind the lathe centers after they are hardened, by means of a Union emery wheel placed in an ingenious appliance readily affixed to the lathe. The cut shows the invention in position, A being the grinding wheel, which it will be seen can be placed in the tool post and as easily adjusted to its work as an ordinary turning tool. It is guided by the handle shown, and is actuated by the belt passing over the idlers and receiving motion from the cone pulley.

The simplicity of this device, its ready adjustability, and the facility with which it may be applied to engine lathes of all the various sizes and styles, will render it a useful and convenient addition to every workshop. An operative of ordinary skill can with its aid, it is claimed, true a pair of centers after they have been shaped and hardened in from two to four minutes and so perfectly that not the slightest variation can be detected. For further particulars address the Union Stone Company, No. 93 Liberty street, New York city, and 16 Exchange street, Boston, Mass.



LATHE CENTER GRINDER.

Kid Skins and Kid Glove Making in England.

When dried, the skins feel hard and brittle, and have to undergo the process of staking (the next stage) to render them again elastic. This is done, says *The Leisure Hour*, by means of a semi-circular smooth edged iron plate fixed upright on the top of a stout piece of timber, across which the workman draws the skin, first in one direction and then in the opposite, manipulating it well with both hands until it is soft and elastic. It is then passed on to the parer, who shaves it to a like substance all over by fixing one half of the skin under a strong cord round an ash pole, grasping the loose end with his left hand, and carefully shaving it with his right by means of a circular knife of quoit-like shape and extraordinary keenness, removing the skin, reversing it on his pole, and shaving the other half in like manner, when, after a little polishing or stoning off, and padding down, it is finished. We may here remark that at every stage the work is inspected by a competent foreman before it is passed on to that which follows. The skins are now removed to another room, where they are examined and sorted for cutting into such kinds of gloves as they are best fitted for in quality, size, substance, etc.; they are thence sent to the cutter (in lots, generally, of from four to five dozen) with full instructions for his guidance respecting every skin. The cutter, taking one skin at a time, stretches it to the fullest extent, and cuts it up by measure into plain oblong pieces of the required size, which he submits to be stamped while stretched out, as a proof of his correctness in measuring and marking, before finishing them off in the form he is required to give them. From the cutter these oblong pieces, called "tranks," are sent to the puncher, who, taking two or three pairs at a time, and placing them on the knife to which they correspond in size and shape (being so numbered by the cutter), puts them under a press, when the form of the glove is instantaneously produced, with all the necessary slits and openings, button holes, gussets, etc., for enabling the sewer to put them together. The thumbs and the forgettes or fourchettes, the pieces put between the fingers, are punched separately. The "tranks" now go to the trimmer, who, with a very fine cutting pair of scissors, removes any little roughness that may have been left in the punching, after which they are supposed to be finished, though they have yet to be again closely examined, so as to correct any faults and prevent any defective pieces being sent out to the sewer. Having passed this examination they are handed to boys, who fold each pair with its complement of thumbs, forgettes, and other pieces inside, and put them up into half dozen or dozen packets, each packet with full instructions for making, written on the band; the sewing materials are then added to each packet; and after being duly entered out, they are taken by traveling clerks to the various sewing stations throughout the county of Worcester, and into parts of Warwickshire, Oxford, Hereford, Gloucester, Devon, and Somerset. Each clerk will take out daily the number of dozens required for his particular station, and bring home made goods to a like extent, the quantity varying with the population of the different localities. All these goods when brought in from the makers have yet to receive the last finish, that is, the "topping," button and button holing, etc., and this is done by hands in the city of Worcester, within easy reach of the manufactory. The gloves are now completed; but they must still be "dressed," or put into straight and attractive form; they are then subjected to their final examination by an expert and, when passed by him, have the firm's name stamped inside one glove of each pair; after which, being neatly made up, banded in half dozens, and put into small boxes or cases, they are labeled and sent off to the London warehouse, whence they are distributed to every part of the kingdom, the colonies, America, etc. Messrs. Dent and Co. now employ nearly seven hundred hands within the walls of their manufactory, and about five thousand sewing people, etc., outside.

A WISE man's thoughts walk within him, but a fool's without.

Shell Mounds on the California Coast.

San Pablo is about fifteen miles from Oakland, and lies almost due north, and the road follows the beach. When within three miles of the town we came to a shell mound, says a correspondent of the St. Louis *Globe*, rising up from the plain to almost the dignity of a hill, and which is now covered with a growth of shrubbery. There is no telllng when or by whom that mound was raised, but it is almost a mile long and half a mile wide.

Fragments of pottery made of red earth, not to be obtained anywhere in this State, are found on the surface and near the top; and about two years ago Mr. McHenry, the owner of the land, dug a trench, and at a depth of twenty feet, sixty feet in from the west, near the base, found numerous skeletons of Indians of all sizes, and some bones of dogs and birds, and many implements of stone. One baby had been rolled in a monstrously long piece of red silk, like the mummies, and had been covered with a coating of a sort of asphaltum. Mr. McHenry also found in other parts of the hill evidences enough to show that this mound was a burying place for some extinct tribe of Indians, as the skulls are different from all others known in some particulars.

Where the red silk came from would puzzle any one to know, as this must have been a primitive race, judging by the rude implements and utensils. All the skeletons were in a sitting posture, with their faces turned northward. The shells that form this mound are oyster, clam and mussel shells, all having been exposed to the action of fire, and nearly all broken fine. Very rarely are entire shells found. The same kind of mounds, though not so large, are found near San Mateo, on the San Francisco side. They are all near the shores of the bay, and have been made of shells of the oysters and mussels that the Indians used as food, and which they evidently roasted to open.

The Horse Distemper.

By the account of an observer who has recently come from New York, we are confirmed in our impression says the *Field*, of London, that the disease among horses in America is identical with the well known influenza or distemper of horses in this country. Three horses said to be affected with the epizoötic have just been landed in Liverpool from New York, and we are informed that two of the three are in good health; the other has only a slight cough. It appears that the animals manifested the usual symptoms—loss of appetite, nasal discharge, cough, and sore throat—at the commencement of the disease, but rapidly improved under simple treatment, and at the termination of the voyage two of them had quite recovered.

Influenza exists, we understand, among horses in Liverpool, and certainly also in London, although not to any remarkable extent. Cases of the disease came under our notice several weeks ago. In the event, therefore, of the affection assuming the epizoötic form, it will not be necessary to trace its origin to importation of horses from America. The Irish Government issued an order on November 5, prohibiting the landing at any port in Ireland of a "horse, mare, gelding, foal filly, ass, mule, or jennet from or which, at any time after the 30th day of September, has been in any part of America."

No legislative action has been taken by our Government in the matter, nor under all the circumstances does it appear to be necessary to interfere with the very limited importation of American horses into this country.

Influenza, like epizoötics in general, only spreads rapidly and extensively when the conditions are favorable; the occurrence of a few cases every spring and autumn excites no attention.

Sea Sickness in the Horse.

It would be a happy incident for the poor animal if it could always relieve itself by vomiting. Alas! it cannot; this relief is quite exceptional. The sufferings of a sea sick horse are intense. The stomach tries to relieve itself, dry retchings follow, and reach such a climax that the blood is driven into the head and into the brain, and finally the poor animal succumbs to apoplexy and dies in great torture.

New Process of Bleaching Animal Textile Fabrics.

MM. Samal and Berouson have recently patented, says the *Chronique de l'Industrie*, a new method of bleaching animal textile fabrics by means of a feeble solution of the sulphurets of sodium and potassium. These products act in a remarkable manner in removing the gum in preparing silk and in scouring wool. In practice, in the first case, the bath should be boiling; in the second, the temperature of the alkaline sulphuret should not exceed 50° C. The more difficult it may be to remove the gum and prepare the silk, the less the solution should be sulphuretted; in some instances the protosulphuret may be employed.

The inventors have also used in the same manner the aluminates of soda and potash.

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[From Journal of the Franklin Institute.]

TRANSMISSION OF MOTION.

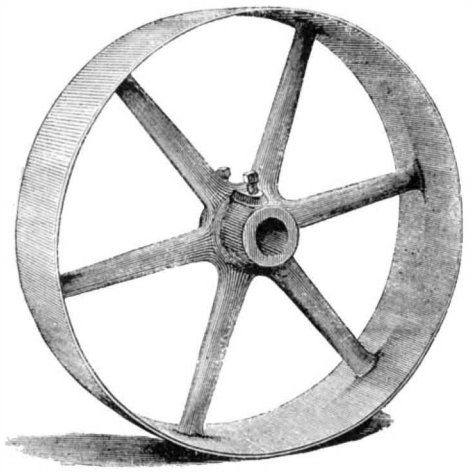
A Lecture delivered by Coleman Sellers, at the Stevens Institute of Technology, Hoboken, N. J., February 19th, 1872.

NUMBER IV.

When very long lines of shafting are constructed of small or comparatively small diameter, such lines are liable to some irregularities in speed, owing to the torsion or twisting of the shaft as power is taken from it in more or less irregular manner. Shafts driving looms may at one time be under the strain of driving all the looms belted from them, but as some looms are stopped the strain on the shaft becomes relaxed, and the torsional strain drives some part of the line ahead, and again retards it when the looms are started up. This irregularity is in some cases a matter of serious consideration, as in the instance of driving weaving machinery. The looms are provided with delicate stop motion, whereby the breaking of a thread knocks off the belt shaft and stops the loom. An irregular driving motion is apt to cause the looms to knock off, as it is called, and hence the stopping of one or more may cause others near them to stop also. This may in a measure be arrested by providing fly wheels at intervals on the line shaft, so heavy in their rim as to act as a constant retardant and storer of power, which power is given back upon any reaction on the shaft, and thus the strain is equalized. I mention this, as at the present time it is occupying the thoughts of prominent millwrights, and the relative advantage and disadvantage of light and heavy shafts is being discussed and is influencing the practice of modern mill construction.

I have mentioned the method of uniting bars of round iron so as to make long lines of shafting, in considering the theory of the coupling. I have given you an insight into the principles involved in a successful bearing for the shafts to revolve in, and I have dwelt a little on the shafts as regards size and velocity. I will now call your attention to the pulleys or band wheels. See Fig. 18. The best belts or bands used on these wheels are of leather, kept in good con-

FIG. 18.



dition by the judicious use of oil. Belts of leather are made of single thickness of leather for some purposes, and of two or more thicknesses for the endurance of harder strains. In general, main driving belts are made double thickness, and belts for transmission of power to machines, with some exceptions, are made single thickness. The terms double and single belts have come to be applied to leather bands in the trade, while India rubber belts, now quite extensively used, and often to advantage, have their grades indicated by one ply, two ply, three ply, etc., as indicating their thickness. It is of the utmost importance, for considerations of economy in running as well as first cost, that pulleys should be made as light as is consistent with strength. Pulleys that are to sustain the weight of double belts must be made heavier and stronger than those that are to sustain the weight of single belts; and the use to which the pulley is to be applied must influence its proportions. In the early practice of making cast iron pulleys, it was believed necessary that the arms should be made something like the letter S on the plane of the pulley. The idea was that they would be less likely to break from shrinking strains in the casting. It is quite evident, however, that a straight arm, such as one in the samples shown you (see Fig. 18), representing a straight line from the center to the circumference, will take the least metal; and I can state as a fact, after very long experience, that pulleys made with straight arms are the strongest, with equal proportions, provided proper precaution be taken in selecting the iron to be used in making, and regulating the conditions of cooling. The straight armed pulley can be made with the least possible metal and the greatest possible strength for the metal. Its form is the best able to transmit the peculiar strains brought to bear upon it, and at the same time it is the most pleasing form to the eye. In machinery, as in Nature, fitness to intended purposes has much to do with our ideas of beauty. The arms should be oval, so as to present the least resistance to the air in running, and they should be as light as is possible to make them, consistent with strength. This is of the utmost importance, as the weight of the pulleys on the line shafting often is very great, and this metal must revolve with the shafts, and its revolution costs in proportion to its weight. This cost of rotating the mass of metal is a constant cost irrespective of the work done, hence the need of carefully considering the weight and its reduction to the minimum. Pulleys should be turned truly round, and they should be cylindrical only in the case of belts having to be shifted sideways on their face; for stationary belts the pulleys should be made higher in the center, the curvature of the face being, say, ⅛ in. per foot. In trade, pulleys for stationary belts are termed "high," for shifting belts "straight," on the face. They should be also very carefully balanced. This may be done by turning the rim outside and inside, or it may be done by attaching a mass of iron to the lightest side of the pulley. The former practice holds with large driving pulleys, the latter with the smaller pulleys on the line. Large driving pulleys, when over 3 feet diameter, should always be carefully fitted to the shaft, and be held from turning by a key fitting sideways, never bearing top and bottom. Very large pulleys, say for belts 12 inches wide and over, should be forced in the proper place in the shaft by a forcing press, in the same manner as I stated car wheels are fitted to their axles. The various transmitting pulleys on the line may be so bored as to slide on to their respective shafts and be held by set screws. Pulleys are now made in most large machine shops of so many sizes that they present the readiest means of regulating the speed of the machinery. Some establishments are filled with patterns varying by ¼" in diameter for smaller sizes, say under 12", then by ½ in. up to 18" or 20", and after that by one inch up to 3 feet, and by two inches up to 6 feet in diameter. This variety answers all the purposes of trade. Pulleys made smooth on their faces transmit more power than when rough, and are less destructive to the belts used upon them. The power that can be transmitted by a leather belt running on a smooth cast iron pulley is dependent upon the strain of the belt upon the extent of surface of pulley encompassed by the belt, and the direction that the belt is led to and from the pulleys; but a very safe approximate rule is to assume that every 1,000 feet of motion per minute of each inch in width will transmit one horse power with a single belt. This can be doubled by the use of double belts, but with more severe strain upon the journals. The subject of relative sizes and widths of pulleys, and the various conditions of belt direction, would in itself be enough to fill an hour's lecture, so I cannot enlarge upon it to the extent I would like.

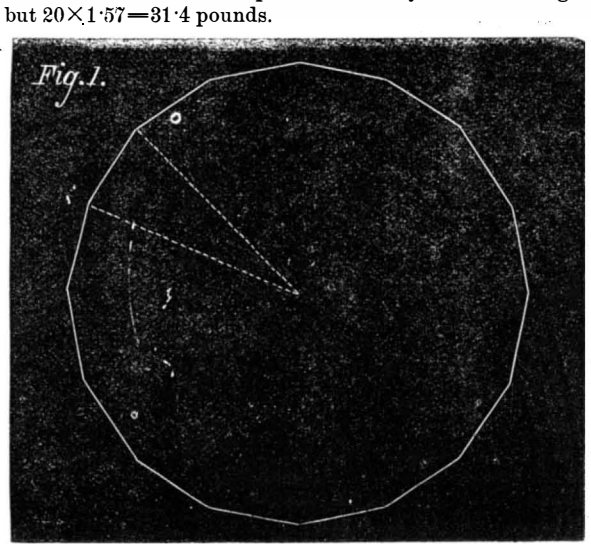
Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Bursting Strain of Cylindrical Boilers.

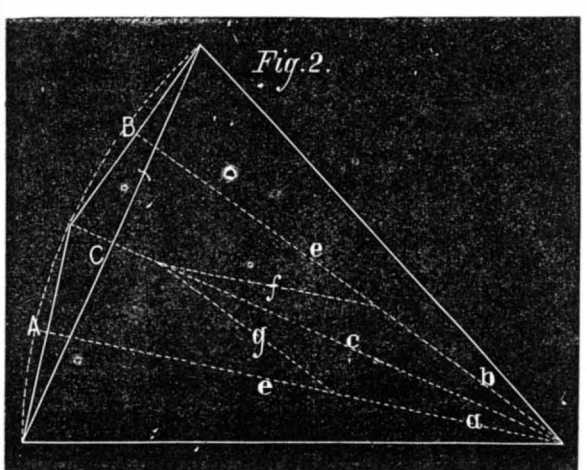
To the Editor of the Scientific American:

I generally get the SCIENTIFIC AMERICAN every week, but do not always have time to read all the articles contained in it. In looking over your number of October 19, 1872, a few days since, I observed an article, which I had not before seen, on cylindrical boilers: and as the conclusions at which your correspondent arrives seem to me to be very erroneous and calculated to mislead, I wish to offer a few remarks on what I think may be regarded as the true solution of the question. He states that the force tending to disrupt a cylindrical vessel by internal pressure is not as the diameter, but as the circumference; that is to say, with a boiler 20 inches in diameter, with an internal pressure of one pound per square inch, the strain upon the shell would not be 20 pounds for every inch of its length, but 20×1·57=31·4 pounds.



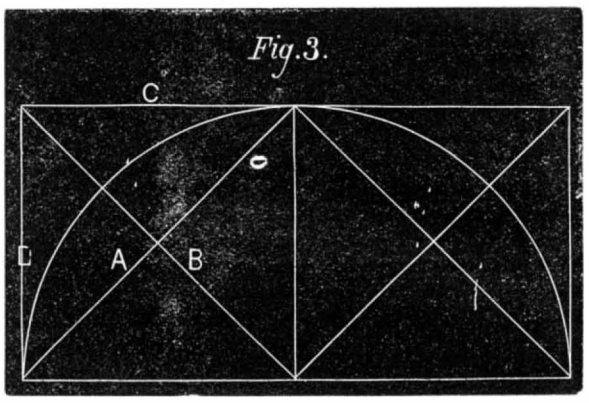
The process of reasoning by which he arrives at this conclusion is not stated; but it appears to have been given in some former articles. Let us then examine this question by the old fundamental law of the composition and resolution of forces, and see what is the answer which it gives to us.

Let us for the sake of illustration suppose the circumference to be divided into a number of planes or chords of arcs.



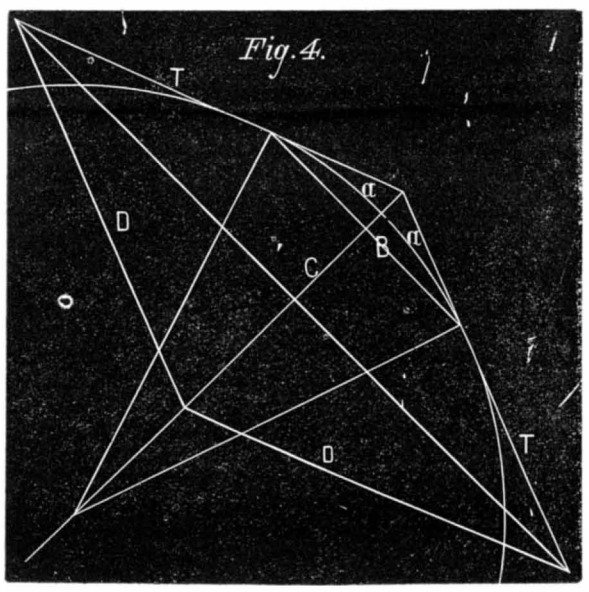
The amount of force exerted upon each of these planes will evidently be in proportion to its length; any two of these forces may therefore be resolved into one, and that force will be exactly equal to the chord of the arc inclosed by both the planes.

Thus A B represents two chords of equal lengths, and the dotted lines, e e, the direction of the force exerted upon them. Mark off a and b equal in length to A and B, and complete the parallelogram a b f g; and by the resolution of forces, the diagonal C of the parallelogram will equal the sum of the forces, and that will be equal to the length of the chord C. We have now found that the sum of the two forces on A and B is equal to the force on the chord, C, of the sum of the two arcs which they inclose. By taking another arc of the same length as C, we can in the same manner reduce these forces also to one, which will be equal to the chord of an arc twice the length of the arc enclosed by C. We can proceed in this manner until we have resolved all the forces into two inclosing arcs of 90° each; and these finally resolved into one will be found to be exactly equal to the diameter. Again, we shall find if we analyze these forces by the same rule that the strain on the shell of the boiler is the same on every part of the circumference, and that that strain is equal to the force due to the radius or half diameter. Take for instance the semicircle shown in the annexed diagram, in which the chord A rep-



resents the amount of force exerted upon the arc of 90° which it encloses, and the line B, the direction of the force and (being of the same length) also its amount. This force, B, will be held in equilibrium by the two forces represented by the lines C and D, each of which is equal to the radius.

Now take any other portion of the circle, and, by applying to it the same rule, we shall obtain the same result. Take any portion of the circumference as the arc, a d. Join the two extremities of the arc by the chord line, B, and from the extrem-



ities draw also the two tangents, T T. From the intersection of the tangent lines, mark off the line, C, equal to the length of the chord. B, and this line will represent the direction and force of pressure acting upon the arc a a.

From the end of the line, C, draw the lines, D D, parallel to the tangent lines, T T, which complete a parallelogram of which C is the diagonal, and which therefore holds in equilibrium the forces represented by the tangent lines T T, which tremities of the arc by the chord line B, and from the extrem-lines are equal to the radius of the circle. Any arc of the circle, greater or less, will give the same result. Thus we have a ready method of ascertaining the strain upon parts of boilers which are curvilinear in form, as we have only to find what would be the radius of the circle of which such curve forms a part; and that will give the amount of strain it endures.

S. S.

New York city.

Prevention of Fires.

To the Editor of the Scientific American:

The Boston calamity, like that of Chicago, will doubtless bring out a vast number of suggestions, some wise and some otherwise.

It seems to be agreed that the fire in this case originated from the steam engine used to operate the elevator; and the flames, being drawn up the elevator shaft, were at once communicated to the Mansard roofs, which were of wood and beyond the reach of the fire engines.

This has called forth a vast deal of denunciation of the Mansard roof, which is all very well, so long as people will build them of tinder, and out of the reach of engines. But it seems to me that people, in their anxiety to condemn these roofs, have overlooked a much more important matter, and that is the danger and folly of locating steam engines in buildings, in the reckless manner that is now practiced in all

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cities. Had it not been for the steam engine there would have been no fire; and it seems to me that it would be much more reasonable to condemn their use than to pitch into Mansard roofs so vigorously.

The amount of property and life annually destroyed in this country, by the use of steam engines, in the compactly built and settled portions of our cities is frightful. Now all this may be prevented by the substitution of either water or air engines for the steam engines. We have both, that are as perfect as steam engines and of are course perfectly safe. True, there is not provision for their use as yet, but that can soon be remedied. Let it once be settled, by law, that no steam engine shall be permitted in any thickly settled portion of a city, and provision will soon be made for the others, both water and air. As to water engines, they can be and are now used to a considerable extent, by simply connecting them to the city water pipes. Of course, the supply of water is not sufficient at present for their general adoption, simply because no such idea was contemplated when the water works were established, and no provision has been made for them. It is, however, a very simple matter to do this; and if there was a demand for it, created by prohibiting the use of steam engines, the supply would soon be furnished. Take, for instance, New York, Boston, Chicago, or any other large city; how easy it would be to lay water pipes for this special purpose, and force water through them by pumps! Sea water would do for this purpose, and the engine for pumping it could be located at any convenient point along the wharf. The water, after being used for the purpose of operating the engines, could then be used to sprinkle the streets, clean the gutters, slush the sewers, and for many other purposes, and thus improve the sanitary condition, while at the same time lessening the demand on the regular water supply for such purposes, which in most cities is fast becoming deficient. There is no doubt that it would pay for any city to increase its water supply for the express purpose of furnishing power, charging a reasonable price for it. It is cheaper than steam power as at present used, and is infinitely safer. In those towns and cities where the Holly system has been adopted, all that is required is to increase the pumping capacity, as the present pipes will answer. If it were intended at the outset to do this, it would be better to increase the size of the pipes, or perhaps have a separate set for that special purpose.

Compressed air may be used in the same manner, but not so well, because it is far more difficult to confine, as it will escape where steam will not; and it is far more difficult to keep the air pumps in working order. One advantage of the air would be better ventilation of shops and buildings, as the escape air might be utilized for this purpose; but I doubt whether it would be of as much use, in a sanitary point of view, as the water.

It seems to me that if "an ounce of preventive is worth more than a pound of cure," this is a remedy well worth our notice. I have no doubt the time will come, when we shall have power conveyed, all through our principal cities, for manufacturing and shop purposes in this way, more especially for all the lighter kinds of work, elevators included; but to effect it, the use of steam must be prohibited.

Washington, D. C. W. C. DODGE.

The Vienna Exhibition.

To the Editor of the Scientific American:

In the presumption that you desire to be correct in your statement of facts in connection with the American department of the Exhibition, will you permit me to point out certain errors in your editorial of November 30?

You say that "In a widely distributed circular issued *from General Van Buren's office*, we find the following remarkable statement: The Austrian government is exceedingly desirous that the United States shall be well represented, and makes *extraordinary concessions* to American manufacturers. The Austrian patent law is practically abrogated for the six months following, and inventors are protected by a special ordinance against piracy of their inventions." Now, sir, the circular from which you have taken this extract I find, upon enquiry, was published by Professor Thurston, of the Stevens Institute, at Hoboken, and bears his name and address in full. It was never issued from this office, nor does it purport to be.

The expressions commented on are perhaps a little stronger than may be warranted, and yet it remains true that concessions have been made and that patents are granted without cost to exhibitors, to be in force during the Exhibition and for two months afterwards. In all my statements upon the subject, I have endeavored to give a careful and true account of what had been done for the protection of our inventors and of what I was striving to accomplish. I have never hesitated to say that the policy of the patent laws of most European countries was piracy and not protection, but I have claimed that the disposition of the Austrian authorities in connection with the proposed Exhibition was to modify existing statutes, so as to protect inventions sent to Vienna from this country.

In referring to the treaty upon trade marks, I have never claimed any connection with it, but have spoken of it as being a step in advance and as evidencing a more liberal spirit. So, too, with the law which permits an exhibitor to take out without cost a certificate which operates for the time as a full patent. I admit, and have always done so, that these are not sufficient, that the obnoxious feature of the Austrian patent law, which compels the manufacture of the article in Austria within one year from date of patent, remains. And I have striven to obtain a treaty removing or modifying that provision, not "by simply sending a draft to Washington," as you allege, but by months of correspondence with the proper authorities of both countries and by visiting Washington to urge speedy action. And I have faith to believe that favorable results may be looked for; but I must be pardoned for judging that the violent opposition of some portions of our press and threats of ruining the prospects of our American department at the Exhibition—if they have any effect—will serve to postpone or prevent the success of my endeavors.

You say again that I have appointed sixty-five assistant commissioners. By what authority, may I ask, is this statement made? Not one fifth of that number have yet been appointed; and they are scattered about in some of the larger cities of the Union, and are engaged in distributing programmes of instruction, giving explanations and receiving and forwarding applications for space, etc.

In regard to an appropriation, I propose to ask that the expenses of a certain number of commissioners be paid, not to exceed a limited sum; and that these commissioners shall give their time and labor to the duties of their positions. A proportion of this commission will be composed of some of our most distinguished scientific men, who will thoroughly examine and report upon all parts of the Exhibition.

I propose also that the Government shall bear the expense of receiving, storing, shipping, freightage, and placing all goods sent to the Exhibition and returning them, of fitting up the American department, of the rental of space, of the construction of a model school building, of the necessary office work and rental in this city, and all the absolutely necessary attendant expenses. If this is refused, of course the Exhibition, so far as we are concerned, will fail, in which failure I shall be but little more concerned than any other citizen; but as a citizen, I should deeply regret such a disgrace produced by such causes. THOS. B. VAN BUREN,

United States Commissioner for the Vienna Exposition of 1873.

[For the Scientific American.]

ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

[For the items of meteorological and astronomical observation and for some of the computations in the accompanying notes, I am indebted to students.

The times of rising and setting of the planets are for the latitude of Vassar College, and are approximate only, no account having been taken of refraction or dip of the horizon, the aim being to furnish to everyday readers the means of recognizing the planets, and of following them in their apparent daily motion from east to west.—M. M.]

The following notes are from the records of the Observatory of Vassar College, from November 1 to 15, 1872:

THERMOMETER AND BAROMETER.

Highest thermometer at the time of recording was
at 2 P. M., November 1.....59°
Lowest thermometer 7 A. M., November 5.....25°
Highest barometer 7 A. M., " 5.....30·46 in.
Lowest " 2 P. M., " 7.....29·57 in.

The highest wind was from the northwest, November 12, at 9 P. M.

QUANTITY OF RAIN.

	Inches.
November 3	0·07
" 5 and 6	1·25
" 12	1·675
" 14	0·365
Amount November 1 to 15	3·36

SUN SPOTS.

The spots on the sun have been very numerous, and some of them very large. On November 5, five groups were seen by the aid of a glass of low power. One of these groups was very much extended across the disk. On the 7th, this had stretched along for more than half a diameter, and, on the 10th, was easily seen with the eye (protected, as it always should be, by smoked glass). On the 11th it seemed to reach its maximum; on the 16th, it was still to be seen, although the sun's motion on its axis had carried it nearly out of sight. Even with a low magnifying power, more than thirty individual spots could be counted in this remarkable group. They must have been formed rapidly, as the record of November 4 makes no mention of unusual agitation. At this date (November 16), spots of good size are coming on, and will probably be seen for some twelve days.

OCCULTATION.

November 10, at 7h. 55m. 38·9s. the moon occulted, or seemed to pass over, the star 30 *Piscium*, a star of the 5th magnitude. As the moon was not full, its dark limb seemed to approach the star, which disappeared instantaneously as they met.

POSITIONS OF PLANETS FOR DECEMBER, 1872.

MERCURY.

Mercury passes the meridian, or souths, at 1h. 20m. December 1, and at 10h. 27m. on December 31. On the 1st of the month it sets after the sun, about a quarter before six, and on the last of the month it rises before the sun, a little before 6 A. M.

VENUS.

Venus (at this time, November 16, so brilliant in the southwest), sets on December 1 at 6h. 44m., and on December 31, at 5 minutes before 7.

MARS.

Mars is very small, but can easily be known by its ruddy light. It rises December 1, about half past one in the morning, and keeps nearly the path of the celestial equator, setting about half past one in the afternoon. On December 31, Mars is much further south, being 4° north of the bright star *Spica*.

JUPITER.

Jupiter, the most interesting of all the planets, rises at this time (November 16) about midnight; it is becoming more and more favorably situated for observation, and on December 1 will rise a quarter before eleven, and on the 31st, before nine in the evening.

The best time for observing any planet is when it souths; Jupiter souths, or comes to meridian, in the early morning hours all through December, but it is in northern declination, and in this latitude has a good elevation some hours before meridian passage. By the last of December, it can be well seen in the evening. It is in the constellation *Leo*, between *rho* and *gamma Leonis*, nearer to *rho*.

JUPITER'S SATELLITES.

The four moons of Jupiter can be seen with a glass of low power, and their transits, occultations and eclipses, which occur very frequently, render the observations of this planet intensely interesting. The shadow of the largest of these moons will be thrown upon the face of the planet after midnight on the 21st, appearing generally as a round, black spot. The 4th satellite, which is next to the 3rd in size, will be eclipsed on the 24th and will emerge from the shadow of Jupiter at 11h. 47 m. 48s., Washington time.

Seen in large telescopes, the belts of Jupiter are continually changing, and are, some reddish and mottled by dark and white spots, some dusky and broken into irregular stripes.

SATURN.

Saturn is no longer well situated for observation. It is among the stars of *Sagittarius*, and sets at 7h. 11m. on December 1, and at 5h. 29m. on the 31st. Its ring can be seen with a glass of low power.

URANUS.

Uranus is in the constellation *Cancer*. It rises on the 1st about 8:30, P. M., and is well situated for observation. An ordinarily good telescope will show its disk. It comes to meridian at 3h. 50m. on December 1st, and 1h. 49m. on December 31,

NEPTUNE.

Neptune is in good position, but a very good glass is needed to show it to be a planet. It rises on December 1 at 2h. 19m., comes to meridian, or souths, before 9 P. M. (8h. 46m.), and sets a little after 3 A. M.

The Great Pumping Engine in Chicago.

An immense pumping engine has lately been completed and successfully operated in Chicago. It is of 1,200 horse power, and consists of two machines connected by a single shaft. The two steam cylinders are each 70 inches in internal diameter and allow a 20 feet stroke of piston. The steam chests are provided with double puppet-balanced valves, and the unhooking gear is arranged so that both engines may be controlled at the front of either. The flywheel is 25 feet in diameter and weighs 33 tuns. With the exception of the great machine at Haarlem, Holland of which the diameter of the cylinder is 12 feet and stroke 10 feet, there is probably no larger pump in existence.

During the past year Chicago has laid nearly 20 miles of water pipe; which is more than has ever been placed in the city during a similar period.

Chinese Arithmetic.

The Chinese have a most ingenious method of reckoning by the aid of the fingers, performing all the operations of addition, subtraction, multiplication, and division, with numbers from 1 up to 100,000. Every finger of the left hand represents nine figures, as follows:—The little finger represents units, the ring finger tens, the middle finger hundreds, the forefinger thousands, the thumb tens of thousands. When the three joints of each finger are touched from the palm towards the tip they count one, two, and three of each of the denominations as above named. Four, five, and six are counted on the back of the finger joints in the same way; seven, eight, and nine are counted on the right side of the joints from the palm to the tip. The forefinger of the right hand is used as a pointer. Thus, 1, 2, 3, 4 would be indicated by first touching the joint of the forefinger; next the the hand on the inside; next the middle joint of the middle finger on the inside; next the end joint of the ring finger on the inside; and finally the joint of the little finger next the hand on the outside. The reader will be able to make further examples for himself.

Action of the Brain.

M. Fournié communicates to *Les Mondes* the following interesting experiment on the cerebro-spinal nervous system of animals. He says: "I wished to determine a process which would permit me to injure any portion of the brain without destroying life. With this view I made a small hole in the skull of a living animal by means of the instrument used in surgery for osseous sutures; then across this hole I introduced the needle of a hypodermic syringe (*séringue Pravaz*), and, at the point of the brain I wished to destroy, I injected a caustic solution, chloride of zinc colored blue. The part touched by the fluid was injured; consequently it ceased to fulfil its functions. After the subject had reposed, I noted the symptoms presented for some twenty-four hours and then killed the animal. I discovered readily the injured part by the induration of the tissues and the blue coloration. The experiments show plainly that simple perception resides in the optic couches (*couches optiques*), that distinct perception and memory require the integrity of the cortical periphery, and that the lesion of the circumvolutions is not accompanied by paralysis of the members but only by weakening." The author proposes to extend these experiments with a view of arriving at further important results.

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NVENTIONS AND SUGGESTIONS FOR THE PREVENTION OF FIRES.

Next to saying "I told you so" there is no mental effort which conveys more unalloyed pleasure to the human race than to calmly suggest and expatiate upon means by which calamities might have been avoided, after such misfortunes have taken place. The recent fire in Boston gives rise to many instances of this fact, and the daily journals are filled with editorials and communications, some conveying excellent ideas worthy of careful attention, others suggesting plans as ridiculous and impossible as can well be imagined. The Chicago fire, though a severe lesson, served but to interrupt our sleep of fancied security; the Boston conflagration has been the means of a thorough arousing of the whole nation; and, as a result, plans innumerable for the avoidance of similar disasters are being devised.

A number of these suggestions, some found drifting about in the columns of periodicals, others obtained directly from their originators, we have gathered together; and below we briefly give their general details.

A word at the outset as to roofs, and in particular the Mansard, which, like Mrs. O'Leary's cow in Chicago, has been the special object of public malediction. The blame should not be placed on the architectural design—no one will deny that the roof is handsome and that its ornate pavilions are a great improvement over the squat coverings of former times—the fault lies in bad material and worse construction; flat roofs, if made of thin beams, protected by a single sheeting of tin or slate, would be exactly as unsafe. That we can build proper roofs on the French plan is amply evidenced by the one in process of construction on the new *Staats Zeitung* building and on the Masonic Temple in this city. A mere glance at the massive iron beams and stone window casings of these edifices will remove all doubts of the structures being dangerous.

The main objection to the Mansard is its hight from the ground, but if we provide a proper supply of water and suitable means of forcing it where it is needed, this can be overcome.

Like Chicago, Boston has demonstrated the value of brick over every other building material, as a fireproof substance, and consequently many of the plans suggested are based on the construction of brick walls.

A daily contemporary editorially says that parapet walls should be placed between the houses, eight or ten feet high and pierced with a few apertures so arranged as to admit a free play of hose pipe. These partitions are designed not only to check the advance of the flames but also as barricades behind which the firemen can obtain shelter.

A recent invention consists in building two immense walls of solid brick masonry intersecting in the center of every block. At the point of intersection the partitions are highest, their upper edges sloping off to the corners of the building. The idea is to confine the fire to one quarter of the square and so prevent its spread.

Another proposition is to carry the walls of a building three feet up above a flat roof, forming a reservoir which is to be flooded with water from below by a force pump.

One of the best plans is that derived from the French, and consists in making all partitions and floors of solid plaster and iron.

A scientific contemporary advocates the construction of partitions analogous to sectional iron boilers. Iron enclosed water spaces are suggested, not to be over one inch in thickness and subjected to a hydraulic pressure of three or four feet head. The sections are to be flooded in case of fire.

Various plans are published having in view increased water facilities. It is proposed to carry river water through the streets in large mains, from which pipes are to extend through the houses and above the roofs, having suitable hose connections in every story, by which, the water being under pressure, a thorough flooding can in a short time be effected.

Another idea is to erect reservoirs on elevated positions into which salt water is to be pumped and distributed by pipes throughout the city.

A very similar device is to build towers along the ridge that forms the backbone of Manhattan Island, and supply fresh water drawn from the Hudson river some distance from its mouth.

In Chicago wells are suggested, which, communicating with the river, are to be sunk at suitable points and an increased quantity of water thus obtained.

Another design, for utilizing salt water, is to locate a powerful pumping engine in every fire district, which, in connection with a large standing pipe, is to maintain such a constant pressure at every hydrant as to obviate the necessity of fire engines.

One excellent idea is the pressing of the ferry boats into service, placing them under the orders of the Chief Engineer and requiring them to carry donkey engines of uniform power, with hose nozzles regulated to a standard gauge. In case of fire, the vessels are to congregate at some fixed point and act in concert in forcing water into the city.

Additional mains from the Croton reservoir are suggested, by which the supply is to be economized by forbidding tapping except in certain localities.

A well known engineer considers it practicable to force salt water, in time of emergency, through the regular fresh water pipes, which he would have constructed of double their present size.

One of the best devices for the application of water is that published some time since, in this journal, consisting in a large number of perforated pipes extending entirely through the building. By merely turning a cock, thousands of fine streams are thrown in every room.

A recent invention on this principle consists in permanently affixing a perforated pipe at the summit of the roof, allowing the water to run over the latter, and thence down the side of the building.

A further improvement is a portable system of perforated tubes, which can be readily laid along a roof or rested on supports within the building and thence connected with the engines. This plan has the advantage that the firemen can thoroughly drench buildings even at their highest portions, which otherwise they would be unable to approach on account of the heat.

We have encountered two ingeniously ridiculous ideas. The first is the proposition that our fire department be provided with rolls of thick woolen blankets, sufficient to surround a block of houses. With these the fire is to be smothered by hand, while the cloth is kept wet by the engines. The second inventive genius thinks that a woolen veil, saturated with water and placed between a fierce conflagration and threatened buildings, will instantly avert all danger.

From all the plans, ideas and suggestions above enumerated, and from the experience we have so dearly earned, a few general conclusions may be safely drawn. Of these the chief is that a city to be fireproof needs both properly constructed buildings and a thoroughly efficient water supply. No matter how well organized a fire department may be; if the houses are built of inflammable material, disasters greater or less must ensue. And on the other hand, even if edifices be never so well constructed, if the water supply and its mode of application be not as nearly perfect as can be, similar consequences will follow. In the construction of fireproof buildings, brick should be preferred. Walls should be thick and solid. Avoid hollow partitions and floors of wood or lath and plaster. Employ iron beams and either solid plaster or surfaces of plaster packed with nonconducting and noninflammable material within. Provide double iron sliding shutters to all windows. Place iron trap doors on the elevator shaft at every story, and thus be able to cut off the immense draft it produces. Introduce a reliable system of perforated pipes or similar devices for sending water throughout the structure, and provide hand fire extinguishers ready for immediate use.

For the high buildings of large cities, steam fire engines have been proved inefficient. Therefore an additional supply of water must be provided, drawn from the rivers, kept under constant pressure capable of throwing the highest necessary stream. The water supply should be so introduced as to be available as furnishing power for elevators, supplying small manufacturers and others, thus enabling them to dispense with steam apparatus and its attendant dangers.

Blowing up buildings with gunpowder is a last resort and should never be left in such unskillful hands as it was at Boston. Fire must be fought by men practised in the war-are, and never delegated to the inexperienced, however willing.

Lastly, in every city in the country is needed a well considered code of municipal regulations in regard to precautions of every kind against fire, enforced by heavy and severe penalties, and in addition, a rigid and efficient system of inspection to see that such regulations are fully observed.

What is Slate, and how was it Formed?

That slate may have been once mud is made probable by the simple fact that it can be turned into mud again. If you grind up slate, and then analyze it, you will find its mineral constituents to be exactly those of a very fine, rich, and tenacious clay. Wherever the top of the slate beds and the soil upon it is laid bare, the black layers of slate may be seen gradually melting, if I may use the word (says the Rev. Charles Kingsley in "Town Geology"), under the influence of rain and frost, into a rich tenacious clay, which is now not black like its parent slate, but red, from the oxidation of the iron which it contains. But, granting this, how did the first change take place? It must be allowed at starting that time enough has elapsed, and events enough have happened, since our supposed mud began first to become slate, to allow of many and strange transformations. For these slates are found in the oldest beds of rocks, save one series, in the known world; and it is notorious that the older and lower the beds in which the slates are found, the better—that is, the more perfectly elaborate—is the slate. The best slates of Snowdon (I must confine myself to the districts which I know personally) are found in the so-called "Cambrian" beds. Below these beds but one series of beds is as yet known in the world, called the "Laurentian." They, occur, to a thickness of some 80,000 feet, in Labrador, Canada, and the Adirondack mountains of New York; but their representatives in Europe are, as far as known, only to be found in the north-west highlands of Scotland and in the island of Lewis, which consists entirely of them, And it is to be remembered, as a proof of their inconceivable antiquity, that they have been upheaved and shifted long before the Cambrian rocks were laid down "unconformably" on their worn and broken edges.

Mechanism.

How much the people of England owe to the development of mechanistic germs, says Dr. Rigg in a recent lecture, may be inferred from the statement that if the work of machinery on this little island home of ours for one day had to be accomplished by single human power, the population of the whole globe would hardly suffice to do it. Where such stupendous results are evolved, many minds must have contributed to the common stock; and if what those who are competent to form an opinion tell us be true, namely, that man, in this nineteenth century of the Christian era, is in mental and physical power as he was nineteen centuries before that era commenced, then the conclusion is obvious, that he who would contribute new ideas to these contrivances which minister to our comforts and our wants, must investigate the contrivances that have been already made.

Investigation should never be dormant; and yet it does sleep, and soundly too, until a "strike" or a "lock out" reminds society that machines and not men are in all respects best adapted to do much of the work now slowly and slovenly produced by manual labor. They do it, too, with an accuracy, a perfection, and a speed which the direct application of human skill seldom attains. In the bodily frame is mechanism for various purposes; in the machine, for one purpose only. "Strikes" and "lock-outs" often bear unexpected results in the introduction of mechanical contrivances which, in time, extinguish particular classes of manual labor.

An inventive turn of mind is, and always has been, common to a very large portion of mankind. Such minds are prone in this century, as doubtless they were in former ones, to live in isolation from that which is without. Hence, whatever seems to originate in themselves is regarded by them as a novelty, and therefore, as such, is concluded to be of value. Many a day, many a night, and many a fortune have been expended on contrivances and experiments which generations long past had emphatically pronounced to be delusions and snares. A sure remedy for this is in the study of that which has been done. It has often fallen to my lot to try to disabuse an inventor of the idea that a specific suggestion had in it either originality, novelty, or utility. The very kindest attempt to do this is as thankless an office as a man can undertake. In placing, therefore, before you a multiplicity of illustrations, it has been in the hope that they may be suggestive of further inquiry.

[From the Quarterly Review.]

THE CONSCIOUSNESS OF DOGS.

A dog feels anger precisely as we do, and after provocation is sometimes vindictive and sometimes placable, according to his individual character. He is susceptible of hatred of the bitterest kind. He is so excruciatingly jealous, that his life becomes a burden in the presence of a favored rival. His envy continually leads him to eat what he does not want least another animal should take it, and to illustrate the fable of the dog in the manger. Gluttony holds out to him temptations under which even his honesty sometimes succumbs; but, on the other hand, from drunkenness he is nobly emancipated. A dog mentioned by the Rev. Thomas Jackson ("Our Dumb Companions"), having been once made so drunk with malt liquor that he was unable to walk up stairs, ever after declined to taste the pernicious beverage, and growled and snarled at the sight of a pewter pot. Again, as to love, Don Juan was a cold and unenterprising character compared to a dog; and as to maternal affection, the mother dog feels it with heroic passion, starving herself to death rather than forsake her offspring. Gratitude may be almost said to be a dog's leading principle, supplying first the spring of allegiance to his master, and ever after reconciling him, with true magnanimity, to take evil from the hand from which he has accepted good. Regret and grief he feels so deeply that they often break his heart. Fear is a passion which dogs exhibit with singular variation, some breeds and individuals being very timorous, and others perfect models of courage, the latter characteristics and fortitude seeming to be more characteristically canine. A greyhound has been known, after breaking his thigh, to run on till the course was concluded. As to hope, no one can observe the dog watching for his master's step, as in Landseer's picture of "Expectation," without admitting that he knows the sentiment as well as we. Pride in a successful chase may be witnessed in every dog, and even felt in the quickened heartbeats of a greyhound when caressed and praised. That dogs have personal vanity appears from the fact that they are so manifestly dejected and demoralized when dirty and ragged by long exposure, and recover their self-respect immediately on being washed and combed. Chivalry and magnanimity may nearly always be calculated upon in dogs, and wife-beating is an offence to which the four-footed beast never descends. The stories are endless of big dogs generously overlooking the insults of small curs, or taking them into water and giving them a good ducking as a punishment for their impertinence, and then helping them mercifully back to land. Sense of property, bifurcating into both covetousness and avarice, is common to all dogs. The kennel, rug, collar, water basin, or bone once devoted to his use, no dog can see transferred to another without indignation. Frequently he "covets his neighbor's house," and attempts to ensconce himself in it surreptitiously; and almost universally he covets his neighbor's bone, and purloins it, if he dare. Even from avarice he cannot be wholly exonerated, observing his propensity to bury his treasures. Shame, after transgressing any of the arbitrary rules imposed on him, a dog displays with ludicrous simplicity; but of the deeper sense of violated modesty which in human beings accompanies the commission of sin, the dog evidently knows nothing whatever. Humor, so far as it can proceed without language, the dog catches readily from a humorous master, and also the enjoyment of such games as he can understand. As a baby crows with glee at "bo-peep," so a dog barks with delight at "go-fetch." Make-believe runs and false starts, romps and ticklings, throwing a ball for him to catch on the grass, or a stick to fish out of a lake, all supply him with pleasures perfectly analogous in their nature to that which boys and men find in blind-man's-buff and prisoner's base, lordly cricket, and lady-like croquet. Lastly, faith in a beloved superior is perhaps the most beautiful and affecting of all the attributes of a dog.

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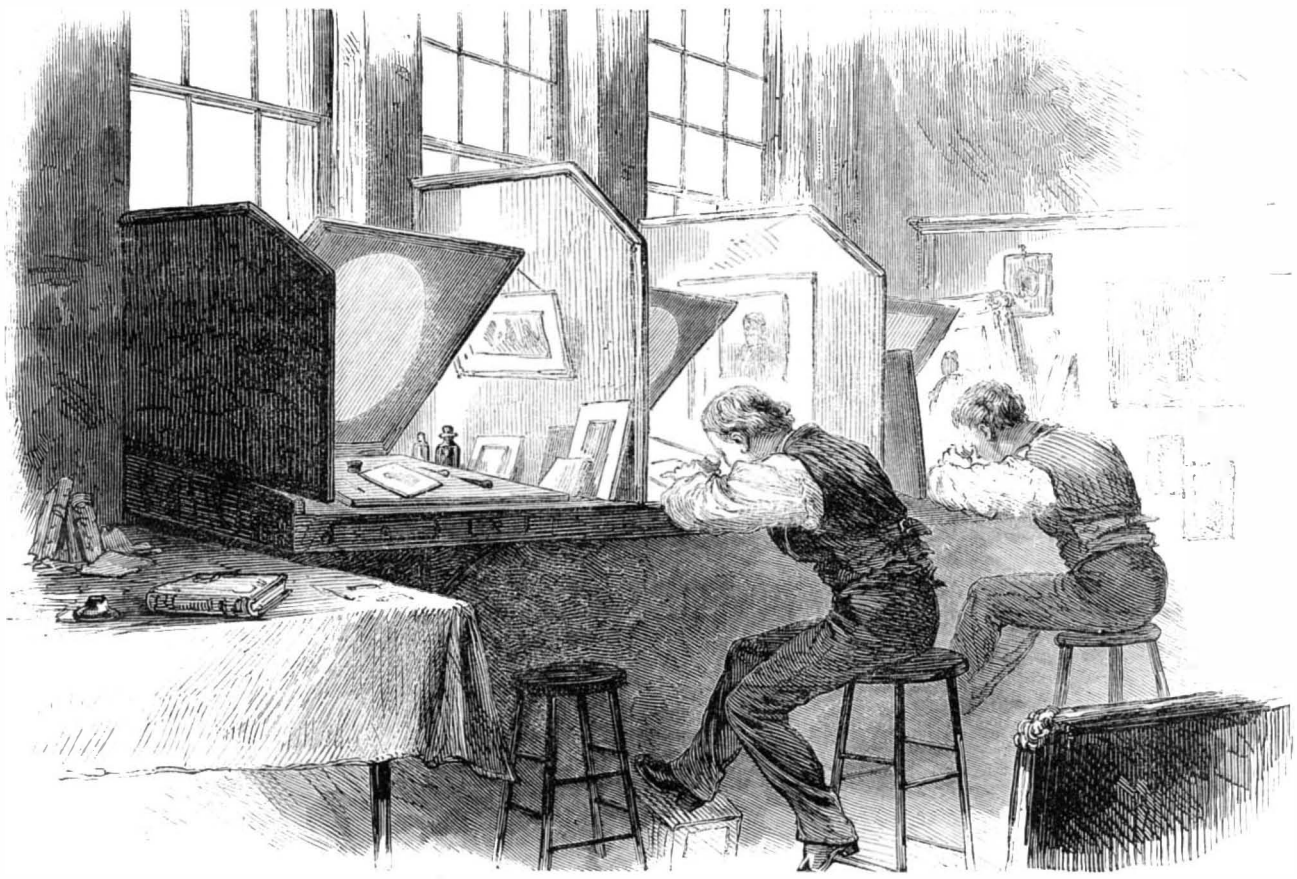
HOW MONEY IS MADE.

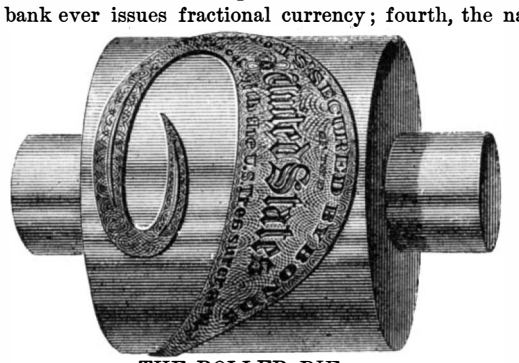
The most interesting of all the public works in Washington is always closed to the public. It is that of making money, carried on in the upper stories of the Treasury Building. A rigid rule excludes all visitors from this bureau of the Treasury Department. The rule is an eminently reasonable one. Millions of dollars in notes, currency, and bonds, are here undergoing a process of manufacture. It is true that precautions might be taken to prevent light-fingered gentry from carrying off any of this valuable stock; but this is not enough. No rule can prevent employees from abstracting something from the immense piles of money if the public are admitted. To prevent the possibility of such abstraction, no workman or workwoman is allowed to leave the room in which he or she works until the money or stock has been counted, and all that has been brought in through the day is found to be safely there, or to be duly accounted for. If anything is missing, no one can leave the room till an investigation is had and the offender is found. But if a score of visitors have passed through the room, an opportunity is left to the suspected person to lay the theft off upon the visitors, and even to employ a visitor as an accomplice in the theft. For the last two or three years, therefore, no one has been allowed in that part of the Treasury building in which the manufacture of money is carried on, without a permit from the Secretary of the Treasury himself. The Government, however, is glad to have the public know what it is doing, and how it performs its duties. Therefore, through the courtesy of the Chief Clerk of the Treasury Department, a representative of the press was recently permitted to visit the mechanical establishment of our money-making institution. His description, accompanying the annexed engravings, we copy from the *Christian Weekly*.



BANK NOTE ENGRAVERS AT WORK.

To obtain accurate information as to the manufacture of currency and postage stamps, it is not enough merely to visit the Treasury Department; three great printing establishments combine in the manufacture of every bank bill issued by the United States—the Treasury Department, the American Bank Note Company, and the National Bank Note Company. Through the kindness of Mr. J. Macdonough, the superintendent of the latter company, the writer had the opportunity of spending half a day in their manufacturing establishment, which occupies the whole of the upper floors of the Cooper Institute. Many of our illustrations are taken from sketches made there; and the whole article embodies, though necessarily in a very brief form, the results of observation in both visits. Although we are chiefly concerned in the description of the manner in which American money is made, our observation took a wider scope. In more senses than one America makes money for the whole world. Though the United States Treasury Department only prints for the United States Government, the two bank note companies print not only for our own banks, but also for foreign countries. The National Bank Note Company were, at the time of our visit, printing bonds and paper money for Japan, the South American Republics, and several European governments. Indeed, New York city may be almost said to be the center of the manufacture of paper money for the world.

The printing of money in its various forms is a much larger and more complicated operation than most of our readers imagine. There are, first, the bonds of various descriptions and denominations, which serve in commercial circles in lieu of money; second, the bills which are issued directly by the United States Treasury, and which embody a promise to pay on demand, at the Treasury, to the bearer; third, the fractional currency of ten, twenty, twenty-five, and fifty cent pieces, all of which are printed for the United States, for no bank ever issues fractional currency; fourth, the national currency, that is, the notes issued by banks and redeemable by them, but secured by a deposit of United States bonds in the Treasury Department. There are four kinds of money, each of which is, in turn, divided into various denominations, each one having its own peculiar design. Besides these forms of money, there are other forms of paper value which are in the nature of money, such as postage stamps and internal revenue stamps of various kinds and of all values, from one cent upwards. The extent to which this latter business of stamp printing is carried on is indicated by the single fact that the National Bank Note Company, which prints all the postage stamps for the United States, prints 500,000,000 in a year, and sometimes sends off as many as 13,000,000 in a single day—a large wagon load. The reader will hardly expect to get a clear and comprehensive view of these complicated operations in an article confined within two pages of a newspaper; if he does he will be apt to be disappointed.

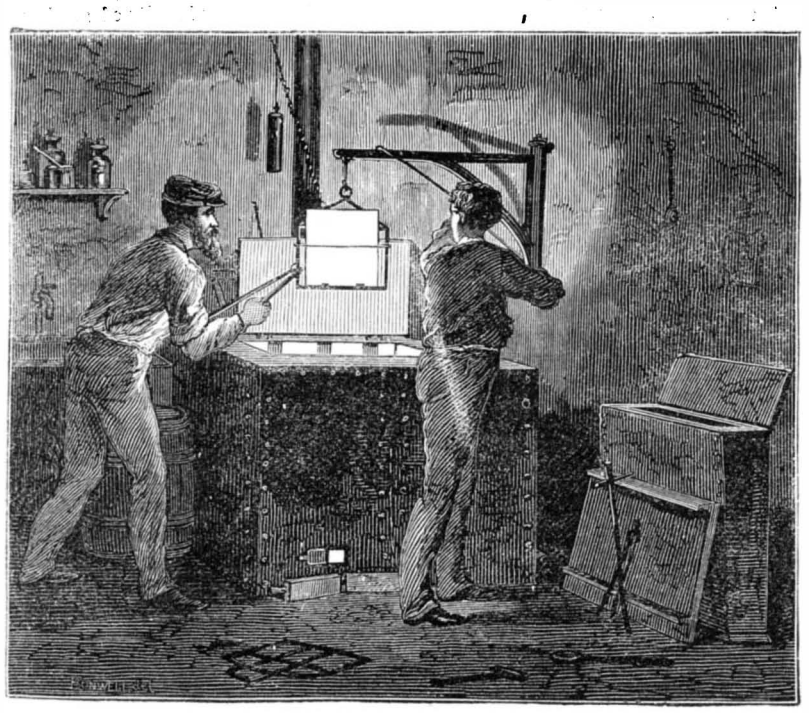


THE ROLLER DIE.

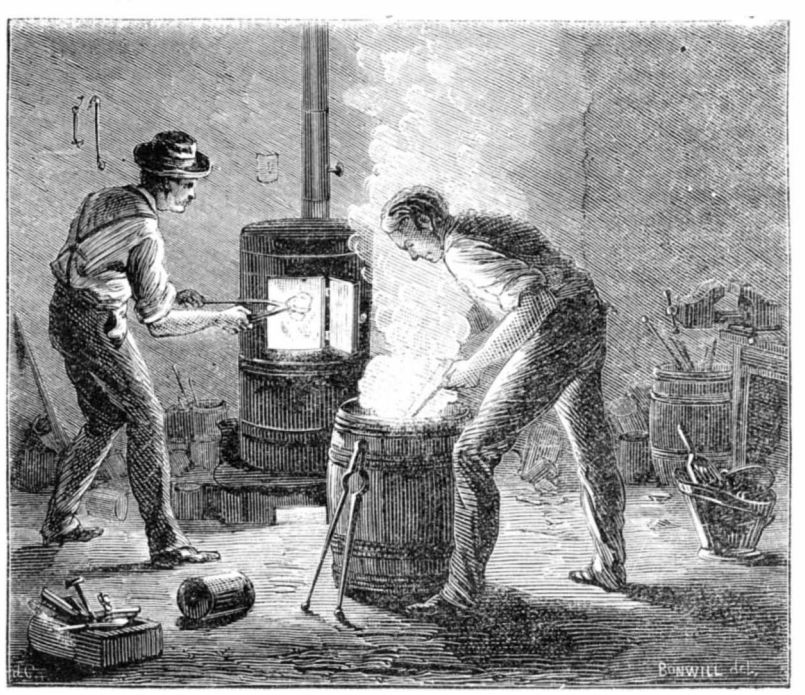
The circumstance which gives to this manufactory its peculiar character and its peculiar interest is a singular one; it is the fact that all over the country are shrewd men, and often men of large resources and extensive capital, who are watching for the opportunity to imitate the legitimate paper money. The utmost skill and the most elaborate system of precautions are necessary to produce an article which private coining cannot successfully imitate. It is this skill which gives to the manufacture of money a character quite different from that of any other branch of mechanical industry. Nor is less precaution taken to prevent the many hundreds who are engaged in the various processes from abstracting any of the money for their own use.

The first precaution is in the manufacture of the paper itself.

If the reader is so fortunate as to have a fresh piece of fractional currency in his pocket, a ten cent or twenty-five cent piece, and will take it out and examine it, he will detect what at first sight appear to be imperfections in the paper on which it is printed. It is full of little specks and shreds of what seems like colored silk. But if he attempts to pick these shreds off, he finds that they are in the texture of the paper itself, and cannot be got off without tearing the paper to pieces. This is the first precaution against counterfeiting. All the money made by the United States Government is printed on this peculiar paper. It is made only at one mill, in the vicinity of Philadelphia. It is a penal offence for any other manufactory to make it. It cannot be made without large and heavy machinery. All the paper on which United States money is printed is manufactured at this one mill. The machine, by means of an automatic register, keeps an account of every sheet of paper manufactured. For every sheet which this tell-tale instrument declares has been made, the proprietors of this mill must account to the United States Government, so that none of the paper can get into the market except by the United States authority. If the reader finds his fractional currency, or his United States note, printed on this paper, he has one evidence of the genuineness, and one which the counterfeiters find it very difficult to copy. They avoid the difficulty by so soiling their bills that this feature, or rather the absence of it, is no longer discernible. Many persons imagine that a well worn bill is certainly genuine. This is a mistake. The appearance of being well worn



HARDENING THE DIES



HARDENING THE PLATES.

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is one easily counterfeited. The national currency, that is, the bills which are issued by the national banks and not by the United States Government, are not printed on this paper.

The next step in the manufacture of money is the printing. If the reader will examine with care a United States bank note, that is, one which embodies a promise to pay, not by a bank, but directly by the United States Government, he will observe that the back is printed in green, which gives to it its title of greenback, while the front, besides the figure and the pictures and the red stamp, which combine to cover the surface pretty effectually, has upon its groundwork a tint, also of green.

The paper when it comes from the manufactory goes to one of the bank note companies of New York, which prints the green back; the sheet so printed is then sent to another bank note company, which prints a green tint upon the face of the note; and the half-printed note is then forwarded to Washington, where the process is completed by printing the pictures, the number, the denomination, the signatures, the words, and the red stamp. The company which receives the paper from the mill gives a receipt for the paper received, which is the voucher of the mill owner to the United States. That company must then turn over to the other company notes equivalent to the full amount of paper received, and must account to the Government for any that are mutilated in the process of printing; and the second company, which gives, in turn, a receipt for the incomplete bank notes, must give to the Government as much as it has received from its associates in in the work. Thus, if there were a fraudulent workman in either company he could not defraud the Government without a confederate in the other company, and both must have a third confederate in the Treasury Department. In short, it would seem to be impossible to foist upon the market any money manufactured for the Government, which it has not duly received and got the value for, without a gigantic conspiracy, involving not only the Treasury Department itself, but also the two greatest bank note engraving corporations in the United States, and probably in the world. Not even a dishonest Secretary of the Treasury has it in his power to defraud the Government by manufacturing money for his own use.

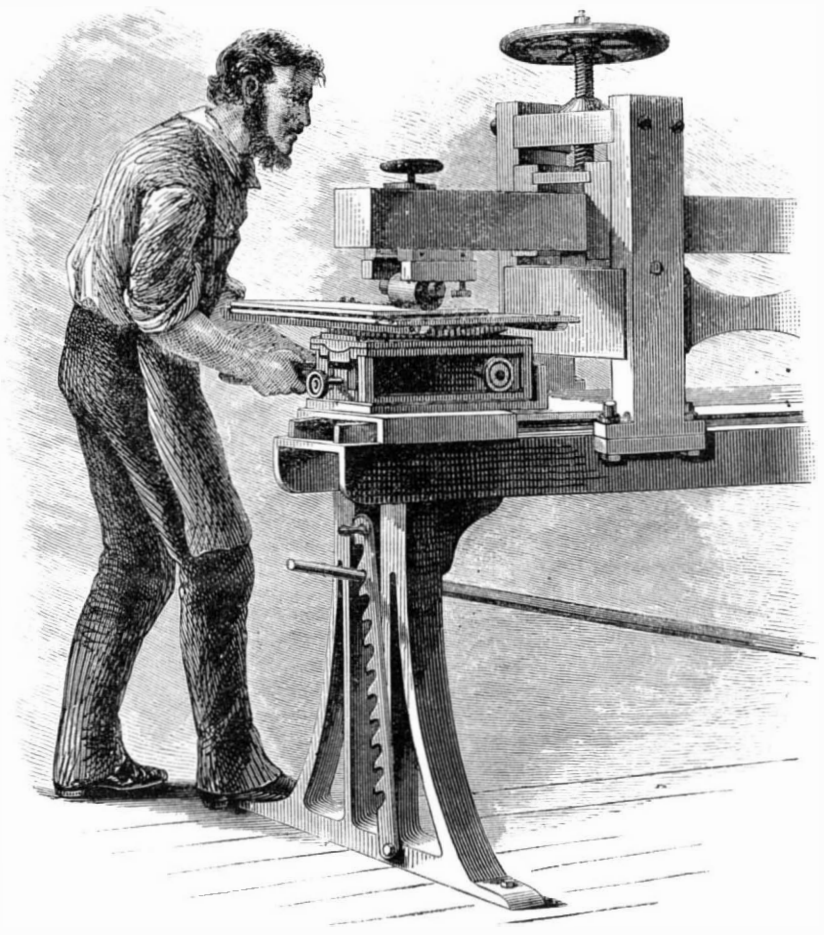
The bill having now passed through three hands—the paper manufacturer and the two bank note engravers—comes into the Treasury Department, where it undergoes the third series of operations, to still guard against the counterfeiters.

The United States Treasury never prints the green back nor the tint upon the face of the bill; but in all the subsequent operations the method is substantially the same, whether the bill be a United States bill printed by the United States Treasury, or a national bank note printed by the National or the American Bank Note Company. One description, therefore, must suffice for both.

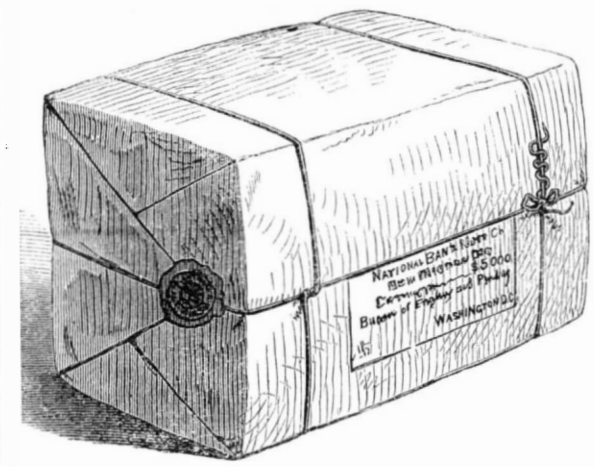
The first safeguard in these printing operations against counterfeiting is the portrait. There are no artists in their profession superior to those who are employed in the designing and engraving of bank notes. By the side of these genuine artists the counterfeiters are blunderers. In a good bill the portrait is always the accurate likeness. To secure it, a daguerreotype is first obtained. This gives a picture on a metallic plate. The features are then drawn lightly on the plate with a sharp-pointed instrument by an artist, who follows accurately the outlines of the portrait. From this outline an impression is printed. The operation of printing, from what is little more than the scratch of a pin, is a delicate one, as may be well imagined. The impression thus obtained is transferred by a chemical process to a steel plate, which is covered with a preparation of wax, the better to receive the impression. The artist then has before him a steel plate covered with wax, on which the outlines of the portrait which he is to engrave have been mechanically transferred from the sun's own painting. These outlines are then traced on the steel beneath by a sharp tool; the wax is removed, and the face is still presented in outline on the steel. The shading is then completed by the workman, who, to accomplish his task successfully, must possess at once the artistic skill of a draftsman and the mechanical skill of a perfect engraver.

This work of engraving is one which requires the utmost accuracy of eye and steadiness of touch. Both in the Treasury and in the bank note company's buildings, there is a large room devoted to the engravers, whose eyes are carefully screened from the light, which is skillfully adjusted to their work by large muslin curtains which surround each workman on three sides. On our visit to the Treasury Department our lady companion asked an old man, who was busily engaged with the engraver's tools, if his work was not very injurious to the eyes. "I have been at work at it these fifty years," said he, "for I am over seventy years old, and you can judge for yourself;" saying which, he pushed his glasses up from his eyebrows, and turned on her a pair of eyes as bright and clear as one often sees beneath the brows of eighteen.

The work of engraving even a single bank note plate requires very diverse kinds of skill. One artist has success with portraits, another with buildings, a third with lettering, another with ornamental work. No one artist ever engraves an entire note; several different artists are always employed to each bill. The processes by which their various operations are combined in one constitute, perhaps, the most curious and interesting of all the various operations in the manufacture of paper currency; but we despair of explaining that process, even aided as we are by the pencil of the artist. We shall make the attempt, but we assure the reader that the operation will not be understood by him, however successful we may be in describing it, without careful attention on his part. The possibility of the feat, we can give it no other name, almost passes our belief, although we have seen it performed. After the design of a bank note is fixed upon, it is given out in separate pieces to separate artists. There lies before us, as we now write, a two dollar treasury note; on it is a picture of Jefferson, a picture of the Capitol at Washington, the printed lettering, "United States will pay to bearer two dollars." the signatures, John Allison, F. E. Spinner, the large figure 2 in one corner, and a great quantity of twos printed in very fine lettering all around the margin, and moreover an elaborate ornamentation in various parts of the bill. One man probably engraved the portrait of Jefferson on one piece of steel; another workman, at a separate desk, engraved, on a separate piece of steel, the printed letters; a third the signatures; others the view of the Capitol building, and still others engraved the small letters on its margin, while still another probably engraved the large figure 2, and one or two more did the ornamental work. Each of these bits or pictures and lettering was engraved, the reader will understand, on a separate piece of steel. Sometimes as many as thirty steel plates are combined in a single note. It is the process by which this combination is effected that is so extraordinary.



THE TRANSFERRING PRESS AND ROLLER DIE.



PACKAGE OF NATIONAL BANK NOTES.

The reader must not imagine steel to be necessarily a hard piece of metal. Hard and softare but relative terms, and the steel of the engraver is made hard or soft, according to his desire. Steel rollers are prepared. They are softer than the steel plates on which the separate fragments of the bank note lines are engraved by the separate artists. By a powerful pressure the various pictures which the artists have engraved are impressed on these steel rollers. They take the impression much as subsequently the bank note itself takes the impression, or as a piece of wax would take it. The work of the artist is, of course, reversed, and the picture, or rather the fragment of the picture, appears on the roller in a legible form, as it will subsequently appear on the note. The artist now has his bank note still in fragments, that is, in separate pieces, but on separate rollers instead of on flat plates. These rollers are now hardened by the action of fire, and thus prepared for the next process. It is the process of transferring. Our artist gives to the reader a picture of the transferring machine. In this machine a flat plate of soft steel is placed, the roller containing some fragment; the portrait, for example, is adjusted by the workman in its proper place over and upon the steel plate, and a pressure of from fifteen to twenty tuns is brought to bear upon it. This pressure transfers the portrait to the steel plate below. The roller is then taken out and the next roller put in its place. This is adjusted so as to bring it in its proper place, and the pressure is again applied. The roller itself is moved gently back and forth by the hand of the operator so as to distribute the pressure equally on all parts of the picture. Thus one roller after another is introduced, the operator depending on his skill of eye and hand to adjust perfectly the various fragments of the complete design to each other until the whole bank note is impressed upon the soft steel plate. The skill and accuracy required in the operation are almost beyond conception. The most powerful magnifying glass brought to bear upon the bank bill fails to show where the various parts of the completed picture have been joined.

This plate is now to be prepared for the press by being hardened. For this purpose it is taken to the furnace and there immersed in a fireproof box containing carbon, and plunged into the furnace. When the requisite heat has been obtained, it is taken out and dipped quickly into oil or brine, or transferred to a vise, which screws its surface hard upon a plate of lead, where it is left to cool. This operation is one requiring the utmost judgment, skill, and dexterity. The heat must be of just the required amount, neither too much nor too little, and when the heated plate is ready to be taken from the fire it must be transferred so instantly from the carbon box to the plate of lead or liquid that the air shall have no opportunity to perceptibly cool its surface. This annealing being completed, the plate is ready for the printer.

We ought not to pass by the engraver's operations without mentioning the geometric lathe. The reader will observe, on many of the national bank notes, and on almost all of the United States bank notes, a series of very intricate and involved lines, running to and fro in involutions which defy imitation. In the bank note before us, as we write, the figure 2 is printed on a background formed by these snaky lines. This is done by means of the geometric lathe, an instrument which, by a singular combination of wheels, can be set to marking out almost any conceivable combination of curved lines. The number of combinations is practically without limit. The machine is an expensive one, and can only be made by machinery; the counterfeiters are supposed not to possess one, and they are not able to imitate successfully its work. To the casual observer, the portrait is the best test of a counterfeit bill; to the detective, the lathe work under a magnifying glass affords the final test.

POSTAGE STAMP DEPOSITORY.

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We have left but a word to speak of the printing process. This does not differ very widely from other printing processes, except in being done wholly by hand. Two persons operate the press together. The first inks the plate and so prepares it for the press, adjusts it in its place, and by a turn of the wheel applies the pressure; a second cleans the plate off and prepares it for a second printing. This is done, first, by wiping off the remaining ink with a cloth, and then polishing the plate with whiting, rubbed on with the palm of the hand. Long experience has demonstrated that there is no such polisher as the human hand; but it gets fearfully dirty in the operation. In Washington a register, analogous to that attached to an ordinary gas meter, is connected with every machine, which thus registers every impression taken. This register is locked and the key is in the possession of the superintendent, who thus has a means of proving that no money has been abstracted from the printing room. In the printing room at the Treasury Department eighty of these presses are in simultaneous operation; in one of the print rooms of the National Bank Note Company of New York there were one hundred and sixteen. The men are paid by the piece, and work with marvelous rapidity, and the room presents a very striking picture of busy activity. It can hardly be credited, but it is the fact, that the wiping of the plate by the hand sensibly wears away the steel, and the difference in value of different workmen is measured by the skill with which they succeed in polishing the surface with the least wear—producing the greatest cleanliness and the least attrition of the plate.

The money is now substantially ready for the market. It only remains to print upon it the seal of the United States—a red stamp, which is affixed to all bills, whether issued by the United States or the National banks, and is always printed at the Treasury Department—to add the number, which is changed with every printing by an ingenious contrivance, which our space does not permit us to describe but which gives to every note its own number—and finally to divide the notes, which are printed six or eight on a single sheet and must be separated, an operation which is done in Washington by an ordinary bookbinder's cutting machine but which requires the greatest skill in its manipulation, in order not to mutilate any portion of it. The money is then packed in boxes; if printed by a private bank note company, it is sent to Washington to receive the Government stamp; if in the Treasury Department, it is sent down to the Treasurer, where it is stowed away in vaults, ready for use. Just before our visit to the Treasury Department there had been a careful counting of the money in the vaults. It amounted to $1,038,000,000: or, if the reader gets no very clear idea from figures expressed in billions, and we confess we do not, he may get a better conception from the statement that it comprised ten cords of paper money.

There are some of the products of the press room which, however, never get to the Treasurer. These are the mutilated and imperfect bills. Along with these are bonds and bills worn out by long use and sent to the Treasury to be redeemed. These are carried to a furnace room a few rods from the main Treasury building, and there, in the presence of a committee appointed to witness their destruction, they are burned, the smoke being forced through water to prevent any part of the charred paper from being carried off and picked up for future presentation.

The most wonderful thing concerning these operations remains to be told—the accuracy with which they are conducted. A single sentence from the report of Mr. George B. McCartee, chief of the Bureau of Engraving and Printing, sums up the results of this painstaking care: "It affords me great pleasure to state that, in the engraving, printing, and finishing of $890,483,995, notes, bonds, and other securities, and 104,140,286 stamps during the year (1871), not one note or sheet of paper has been lost to the government."

The Cat Show at The Crystal Palace.

There can be very little question as to when the first animal show occurred. According to Archbishop Usher's calculation, it was in the year 2349 B. C., and the place where it was held was Noah's Ark. It lasted for at least nine months, says *Land and Water*, and must have been a hard time for Noah and his family if the antediluvian animals wanted anything like the attention that their descendants get in these days at the Regent's Park. How they fed the *carnivora* at all, and how they stowed away enough green food or hay for the *graminivora*, is an interesting subject of inquiry which I must pass over for to-day. Further on in history there were grand beast shows at Rome. Sulla exhibited 100 lions, Scaurus a hippopotamus and five crocodiles, Pompey 600 lions and twenty elephants, Julius Cæsar several giraffes, Augustus a snake fifty cubits long, Trajan 11,000 animals in all, and Probus 1,000 ostriches, among other live luxuries. In all these cases the enjoyment of the Roman citizens, who were the principal witnesses of the show, was hightened by the death of the curious beasts which had cost their exhibitors so much money and trouble; and the same strange principle was adhered to later in history, when the Smithfield Club, so lately as in 1798, took to exhibiting fat cattle, which were killed by the butcher instead of killing each other. It was not till 1838 that the Royal Agricultural Society hit on the brilliant idea that an animal need not be killed because it had been exhibited, and as soon as mercy prevailed over sacrifice the system became popular.

The fourth cat show, which lately closed its doors, was an improvement, both as to the quality and the number of entries, on any previous. The arrangements were very good and the comfort of the animals so strictly studied that they suffered as little as possible from their confinement, and only lifted up their sweet voices occasionally. But five days in a cage is a great trial for a cat which is used to liberty, and it is no matter of wonder that some of the prisoners were looking very weary before the time came for their release. Perhaps variety of color was the most striking feature of the show. White and black, tabby and tortoiseshell, and their various combinations, are familiar to all of us, but here in addition were mouse color, whity brown, bright reddish yellow, pale grey, pug dog brown, a greenish grey, like a Scotch hare, and other strange shades, causing the visitors to play desperate havoc with the tenth commandment. Cats and kittens all told, and without including certain interlopers in the way of puppies and birds which were in the cages with the cats, there must have been about four hundred animals in the show, the largest and finest being No. 257, a monstrous tabby tallow cask of a cat, with a splendid skin, weighing nearly twenty-two pounds, and superior in all respects to the well known "Museum Street Jack," the heavy weight champion of previous shows, who never quite reached twenty pounds in weight. Perhaps the handsomest cat exhibited was No. 281, a magnificent *brun doré* from Paris, "Fritz" by name, only two years old, and with a face like an eagle owl's, beautiful to the last degree, and capable of looking exquisitely savage on very slight grounds. Most cats are self-satisfied enough, but "Fritz" was absurdedly consequential, and held his dainty little nose in the air with the look of an opera *prima donna* obliged to sing in a barn.

Erratum.

In our article entitled "Scientific and Mechanical Possibilities," on page 329 of the current volume, it is stated that "it is not within the possibility of mechanism to bore 4,000 feet more." It should read: "Is it not," etc.

CROSS BREEDING OF FISHES.—Mr. B. Hanson, of Stavanger, in Norway, has, according to a correspondent of the *London Athenæum*, accomplished a novel feat in pisciculture by producing a new hybrid species, a cross between *Salmo alpinus* and *Salmo eriox*, the former species spawning four weeks before the latter. Mr. Hanson's manner of bringing together the spawning maturity of the two species is ingenious. When *Salmo alpinus* has been spawning for some time, Mr. Hanson secured a female fish in an interesting condition, and imprisoned her in a perfectly dark tank, where he left her alone. In a like manner Mr. Hanson, as soon as possible, secured the sire of the first couple of *Salmo eriox* he found in mature condition for spawning, and put him under a similar arrest, and kept a close watch over both until the time of the sire came. In this manner Mr. Hanson has succeded in rearing, with only a loss of one per cent, in his spawning boxes (supplied from a subterranean well which flows with a uniform temperature of + 5½° Réaumur all the year round) a new species, which attains full development in four years, and is remarkable for its exceeding vigor and wildness in water, and its palatableness on the table. Mr. Hanson entertains sanguine hopes of this species becoming self-productive in course of time, contrary to all experience of hybrid fish, because he has already caught in his pond several individuals with roe in them."

DANGEROUS DIETS.—The failure of the potato crop in England is likely, from what we read, to bring about an epidemic of scurvy, unless the public can be better informed of the requirements of an antiscorbutic diet. The fact, therefore, cannot be too widely made known that pease pudding, haricot beans, and boiled rice, which have been suggested in the journals as substitutes for potatoes, will not prevent the occurrence of scurvy. In the absence of the potato, an excellent antiscorbutic, fresh green vegetables or fruits will be requisite, or the health will certainly fail, even though fresh meat be taken. Amongst the vegetable material which may be used, the *Lancet* states, are the various forms of cabbage, lettuce, oranges, lemons, onions, mustard and cress, dandelion, and sorrel. The experience of the crews of vessels on long voyages has shown, over and over again, the uselessness of the pea and bean tribe in preventing scurvy.

VELOCITY OF NINE-POUNDER SHOT.—Experiments have recently been made to determine the velocity of the nine-pounder shot when fired with various charges of powder. From the nine-pounder gun of 8 cwt., with 3½ lbs. of rifle large grain powder, a velocity of about 1,500ft. per second was registered, the gun being quite uninjured. In order to obtain these results on service a stronger carriage is required, and will probably shortly be made. The carriage on which Sir J. Whitworth's new gun was fired on the sands at Southport has endured the strain of the heavy charges exceedingly well.

AIR was compressed by Professor Tyndall, by means of a column of water 260 feet high, to one eighth of its original volume (120 lbs. to the square inch) and then allowed to escape. As it rushed out, it expanded so violently and caused such an intense cold that the moisture in the room was congealed in a shower of snow, while the pipe from which the air issued became bearded with icicles.

SCIENCE is studied by the observation of facts. But observation is not easy. It requires more memory and a further perspective than most men possess. Experiment, too, is necessary, which is a series of questions put to Nature, and no witness can be found more difficult to examine.

MANUFACTURE OF LETTER ENVELOPES.—One establishment in New York city, that we know of, is now turning out nine hundred thousand letter envelopes daily.

DECISIONS BY THE COMMISSIONER OF PATENTS.

Horse Rake Patent.

CALISTA E. COX, EXECUTRIX.—*Extension.*

In the matter of the application of Calista E. Cox, executrix of the estate of Harvey W. Sabin, for extension of patent No. 7,813, for improvement in horse rakes, granted December 3, 1850. Extension granted for seven years from June 8, 1872.

Preserving Hops.

BATES *vs.* SEEGER & BOYD.—*Interference.*

Appeal from the Board of Examiners-in-Chief in the matter of the interference between the application of Benjamin Bates and the patent of Seeger & Boyd for an improvement in preserving hops.

To pack goods of various kinds in bottles or cases made airtight, in order to preserve their contents more effectually, has been common from time immemorial, and cannot be monopolized under a patent.

THACHER, Acting Commissioner:

The patent was granted to Seeger & Boyd, December 12, 1871, application therefor having been filed the 20th of October preceding.

The application of Bates was filed January 13, 1872.

The patent contains two claims. The first is in interference, and is as follows, viz:

As a new article of manufacture and trade, hops ground or pulverized and incased in airtight packages, as and for the purpose set forth.

The gist of the invention is the airtight package. Neither party claims here the article itself, and, in fact, there is proof in the case that it is entirely destitute of novelty.

I can find nothing whatever patentable in what Bates has done. Covered cans and boxes, and corked bottles, are the most common devices in the world for securely keeping solids and liquids of every description. There is no more reason for granting a patent for a bottle or can of ground hops than of ground pepper, ground spice, or any other pulverized substance.

It will undoubtedly be said that objections of this nature apply with equal force to what is called an invention in the patent of Seeger & Boyd. I freely admit it. Why such a patent should ever have been allowed is beyond my comprehension. It has been the practice to hermetically seal cans, bottles, and packages of every description from time immemorial, and for the purpose of preserving their contents in their original condition. The result in this case is precisely what every one would have expected; there is no new discovery whatever. Not even *special skill* is required to practice the wonderful art described; much less is there the least demand for the exercise of *inventive genius*. A mere child can put ground hops into a bottle and cover the cork with sealing wax.

The grant of such patents, for what is utterly unworthy to be called invention, is a fraud upon the public, and is to be condemned in the strongest terms.

Unfortunately, the patent of Seeger & Boyd is beyond the control of the Commissioner, and it therefore becomes necessary to formally pass upon the question of priority.

Judgment on this point must be given in favor of the patentees.

Lead Pencil Eraser.

Appeal from the Board of Examiners-in-Chief in the matter of the interference between the applications of Samuel D. Hovey, Joseph Illfelder, Philip Hufeland, J. Reckendorfer, and T. H. Muller for letters patent for an improvement in eraser attachments to lead pencils.

THACHER, Acting Commissioner:

The inventor of a short paper sleeve, which serves only to connect an India rubber eraser to a pencil, and does not cover the rubber so as to protect it and make it firm, is entitled to a patent for what he has invented only, and not for such a one as would embrace the latter feature.

Notwithstanding the patent thus allowed, a subsequent inventor of a paper sleeve, made long enough to cover and protect the rubber and strengthen the connection, may have a patent for it.

Where there is reason to doubt whether the only invention to which the successful party in an interference is found to be entitled is new, his application should be referred back to the Examiner to investigate the question.

The testimony in interference cases should be so construed as to conform to the preliminary statement of the party producing it; and such as is inconsistent with it should be disregarded.

The date of an invention originated abroad can be carried back no further than the time when specimens embodying it are shown, on satisfactory evidence, to have reached this country.

Judgment in favor of Hufeland.

DECISIONS OF THE COURTS.

United States Circuit Court, District of Connecticut.

RUSSELL AND ERWIN MANUFACTURING COMPANY *vs.* MALLORY *et al.*

A suit in equity, brought by the Russell and Erwin Manufacturing Company against Mallory, Wheeler & Co., under letters patent granted to Rodolphus L. Webb, December 31, 1867, for "improvement in reversible locks and latches."

Before Judges WOODRUFF and SHIPMAN.

DEFENSES NOT SET UP IN THE ANSWER—COMBINATIONS—ABANDONMENT—ESTOPPEL—WEBB'S PATENT FOR REVERSIBLE LOCKS AND LATCHES.

If Webb's reversible latch was new and useful it was patentable, and his patent is not to be held invalid because he only claims the latch *when used in an outer case containing also lock mechanism*—and this even though there be no relation between the latch and the lock.

The statute secures to the inventor an interval of two years in which to test the usefulness and the value of his invention by putting it into use and on sale, without being thereby barred of his patent; and it necessarily follows that, from the mere lapse of the period mentioned, no presumption of abandonment can arise.

When by express enactment an inventor may have two years of trial in the public markets, putting his invention in use and on sale, and yet be entitled to a patent, there is no reason for concluding that he may not also have the like period at least within which to offer his right as an inventor to others—submit the invention to that test of its usefulness and value—and yet be entitled to his patent.

Where it appeared that, during a period of delay in applying for a patent, the first inventor had asserted a continuous claim as such, and a purpose to secure a patent on his invention, and had shown some, though inadequate, appreciation of its value, although another meanwhile had made the same invention and put it on sale: *Held*, that there was no *abandon-*

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ment of the invention by the first party, either as a useless experiment or by a surrender of it to the public.

Where an inventor makes no secret of his invention, cherishes and declares his purpose to procure a patent therefor, and exhibits it to those who, being engaged in the manufacture of articles of a similar character, are competent to judge of its value, in the hope that they may purchase, he himself being in no situation to engage in manufacturing, he is not *estopped* to assert a right to the invention and to claim a patent because his application is not made until nearly two years have elapsed.

Apart from the question of *abandonment*, the mere fact that, prior to the application for the patent, some one has obtained knowledge of the invention and placed the thing invented on sale, whether innocently or fraudulently, does not cut off the prior right.

As between the first inventor and the prior manufacturer no equity can be urged in favor of the latter, except that the former cannot claim damages or profits arising before his patent is granted.

The circumstance that such prior manufacturer is also an original inventor, and believes himself to be the first inventor, does not affect the question. He is in no better situation than one who ignorantly and innocently supposes that the invention is open to the public.

Infringement was admitted. The defenses urged at the hearing were non-patentability of subject matter, lack of priority of inventorship, abandonment of the invention, and estoppel, as is fully set forth in the opinion of the Court.

Patent sustained.

B. F. Thurston and *C. E. Mitchell*, for complainants.
C. F. Blake and *C. R. Ingersoll*, for defendants.

Supreme Court of the United States.
Lamp Patent.

CARLTON *et al. vs.* BOKEE.

In equity. Appeal from the Circuit Court of the United States for the District of Maryland.

MR. JUSTICE BRADLEY delivered the opinion of the Court:

William Carlton and the Bridgeport Brass Company, as assignees of Christian Reichmann, filed their bill in equity in the court below to restrain the defendant, maker of the Comet burner, from infringing a patent for an improvement in lamps, granted to Reichmann on the 21st of September, 1858, and reissued to Carlton and one Merrill on the 11th of August, 1868. The lamp as patented to Reichmann was one of a large number of attempts made about that time to utilize petroleum and its various products for purposes of illumination. The old lamps adapted to sperm oil, lard, and other gross and sluggish oils were unfitted for the use of so volatile and dangerous a substance. In them the flame was set close to the lamp, and the tube holding the wick was projected downward into the oil, so that the heat of the flame might be communicated thereto in order to render it susceptible to the capillary attraction of the wick. Such an arrangement as this with petroleum would have produced a speedy explosion. This article required that the flame should be elevated as far as possible above the lamp, and that the metallic wick-tube should not communicate any heat to the fluid. This was one object to be attained in the burners required for the use of the new illuminator. Another was some contrivance for concentrating a current of air upon the flame itself so as to consume as perfectly as possible all the rapidly escaping volatile gases, both as a saving of light and as a preventive of the disagreeable odors which they would otherwise diffuse.

Two well known burners are conceded to have been in use before Reichmann's invention, which have a material bearing on his claims—the Vienna burner and Stuber's burner. These have been exhibited to us. The Vienna burner contained the flat wick-tube, the ratchet wheel attached thereto (but covered and not exposed as in Reichmann's), and a slotted dome above the wick for the flame to pass through, and a chimney. But the dome was not supported by slender arms, as in Reichmann's, but was connected with a gallery which supported the chimney and surrounded the wick tube and dome, and rested on the lamp or cap below, so that all the light of the flame below the dome was inclosed and lost, and could not issue out, as in Reichmann's burner. The Stuber burner, invented by John Stuber in 1856, and made in considerable quantities in that and the following years at Utica, New York, was an improvement on the Vienna burner in this, that the gallery was so low as to leave a considerable open space under the dome for the reflected light to pass out in a downward direction, and the dome was supported by slender arms; but these arms were attached to the gallery and not to a sleeve fitted on to the wick tube. It differed, therefore, from Reichmann's in these respects: The chimney was supported on a low gallery instead of the dome itself, and the dome was supported by arms attached to this gallery, instead of arms attached to a sleeve on the wick tube. Therefore, with these burners before us, all the invention we can discover in Reichmann's burner is the peculiar mode of supporting his dome by slender arms attached to a sleeve fitted on to the wick tube, and the elevation of the chimney on the outer edge of the dome. The latter peculiarity, as we have seen, is a defect which rendered the burner nearly useless.

We are constrained to hold, therefore, that the Comet burner is not an infringement of Reichmann's original patent or of the invention which is exhibited in his original specification.

It is proper next to inquire as to the bearing of the reissue patent on the question in litigation between the parties. The defenses made by the defendant against this reissue are, first, that it was obtained illegally, wrongfully, and by false pretenses, and because it seeks to claim things of which Reichmann was not the original and first inventor. Secondly, that the original patent itself was void because the only thing in it which Reichmann had any pretense of inventing was anticipated by a man by the name of Michael H. Collins as early as 1843.

The specification of the reissued patent describes the burner of Reichmann substantially as was done in the original patent, being interspersed, however, with observations as to the uses and objects of particular parts, evidently borrowed from subsequent experience and events. The single claim of the original patent is expanded into seven distinct claims.

If they mean anything more than the claim in the original patent, they are void. Being identical with that, they are needlessly multiplied, and by exhibiting a seeming of claims to which Reichmann was not entitled, they are calculated to confuse and mislead. We think it proper to reiterate our disapprobation of these ingenious attempts to expand a simple invention of a distinct device into an all-embracing claim, calculated by its wide generalizations and ambiguous language to discourage further invention in the same department of industry and to cover antecedent inventions. Without deciding that a repetition of substantially the same claim in different words will vitiate a patent, we hold that, where a specification, by ambiguity and a needless multiplication of nebulous claims, is calculated to deceive and mislead the public, the patent is void.

Our conclusion, therefore, is that the Comet burner is no infringement of Reichmann's reissued patent so far as that patent is valid.

Decree affirmed.

J. H. B. Latrobe and *B. R. Curtis* for appellants.
C. F. Blake and *C. M. Keller* for appellee.

United States Circuit Court, Eastern District of Pennsylvania.

ADAMSON *vs.* DEDRICK.

MCKENNAN, Circuit Judge:

This was a suit in equity, brought by William Adamson against Charles H. Dedrick, under the provisions of section 58 of the Patent Act of 1870, for the purpose of setting aside certain letters patent granted to the defendant June 18, 1872, and alleged in the bill to be for the same invention as the patent granted to complainant January 31, 1865.

The invention, as set forth in defendant's patent, had for its object the economizing of time, labor and material in the manufacture of the soles and heels of boots and shoes, and it consisted in cutting, from the raw hide, pieces approximately of the form required and applying the tanning process to these pieces alone. There was thus saved the additional time, labor and material that otherwise would have been required in tanning the "waste pieces;" the cuttings, being in the condition of rawhide and not of tanned leather, were valuable for glue and other purposes, and it was claimed that the soles and heels produced were of better quality.

The complainant's patent was for precisely the same invention, except that he did not limit himself in the application of this process to the manufacture of boots and shoes: his claim being for—

"Cutting from raw or untanned hides or skins, or parts of the same, pieces of the size or about the size and form required for useful articles of tanned leather, and tanning the said pieces after they have been thus cut from the raw or untanned hides, as and for the purpose herein set forth."

The bill was filed on the 24th day of July, 1872, and the writ of subpœna issued thereupon was duly served upon the defendant; but the defendant failed to enter an appearance, and thereupon—namely, on the 17th day of October, 1872—the Court, upon motion of C. Howson, Esq., counsel for complainant, granted a decree declaring said patent of Dedrick wholly invalid, inoperative, and void.

Guard Plates for Stoves.

STUART *et al. vs.* SHANTZ *et al.*

MCKENNAN, Circuit Judge:

A guard plate for stoves, consisting of a series of projecting or deflecting shields, united by ornamental tracery, and so arranged as both to conceal the fire pot and to direct the radiant heat downward toward the floor, is essentially different in form, operation, and effect from a fender consisting of a series of hollow frustums of cones so arranged that the hot air passes obliquely upward and outward from the stove.

That the effects claimed to be produced by the patented invention are produced to a useful and valuable extent, an inference from the public recognition of its merits.

This was a suit in equity, brought by David Stuart and Richard Peterson, trading as Stuart, Peterson & Co., against Enos S. Shantz and Oliver B. Keeley, trading as Shantz & Keeley, for an alleged infringement of certain letters patent for guard plates for stoves granted to complainants, as assignees of David Stuart and Alexander Wemyss, on the 18th day of May, 1868.

As the defendants sought to justify their infringement by setting up a license under a patent granted to W. L. McDowell, April 28, 1863, which was earlier than the date of the invention by Stuart and Wemyss, the validity of complainants' patent was directly called in question. The case was thus made to turn upon a comparison of McDowell's invention with that covered by complainants' patent.

Patent sustained.

C. Howson and *F. Sheppard*, for complainants.
Frank Wolfe, for defendants.

A Perpetual Motion.

A correspondent, Mr. H. R. Birdsall, of Green, New York, sends us a description of a perpetual motion, constructed by an adventurer, which worked so well that he succeeded in obtaining sums of money ($2,500, $1,800 and others) from various simpletons, and then left "to secure his European patents. He has not returned, and a visit to his deserted apartment has revealed a hole in the wall and certain surreptitious mechanism by which the perpetual motion was driven. The beautiful device which elicited the subscriptions of the inhabitants of Chenango county was a self-moving pump, and, actuated by some concealed clock springs, it was the delight and wonder of the vicinity.

NEW BOOKS AND PUBLICATIONS.

ENCYCLOPEDIA OF PRACTICAL RECEIPTS AND PROCESSES, containing 6,400 Receipts, embracing Thorough Information, in plain language, applicable to almost every possible Industrial and Domestic Requirement. By William B. Dick. Price $5. New York: Dick & Fitzgerald.

This is a handsome volume of practical information, partly original and partly collected from the best and most trustworthy sources. Many directions for processes, originally published in our columns, are here collated and compared with other information on the respective subjects. The chief recommendation of a book of this species is the accuracy of the information therein contained; and an investigation of the contents of this encyclopedia has impressed us most favorably as to the value of the processes and recipes, which have been selected with much labor and care. It is a well gotten up book, and is worthy of a place in the library of any home, workshop, factory or laboratory.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]
From October 21 to October 31, 1872, inclusive.

BOOT HEEL.—J. R. Ryerson, Maine.
CIGAR MAKING MACHINE.—G. W. Tanner (of Providence, R.I.), London, Eng.
CUTTING SCREWS.—J. M. Carpenter, Pawtucket, R. I.
ELECTRIC TORCH.—W. W. Batchelder, New York city.
MAKING GUN COTTON.—J. W. and I. S. Hyatt, Albany, N. Y.
MANUFACTURE OF OAKUM, ETC.—T. H. Dunham, Boston, Mass.
MARKING INSTRUMENT.—S. Holman, Philadelphia, Pa.
OBTAINING ANTHRACENE.—J. C. F. Cheever, New York city.
PAPER FILE, ETC.—W. A. Amberg, Chicago, Ill.
PISTON VALVE.—T. Critchlow, Baldwin, Pa.
STEAM GENERATOR.—J. M. Hicks, New York city.
SUBMERGED PUMP.—A. J. Reynolds (of White Plains, N. Y.), London, Eng.
TELEGRAPHING APPARATUS.—D. Craig, New York city.
UMBRELLA, ETC.—A. & I. Herzberg, Philadelphia, Pa.
VISE.—T. Hall, Florence, Mass.

Facts for the Ladies.—Mary J. Clock, New York, has used her Wheeler & Wilson Lock-Stitch Machine fifteen years, averaging, for the first five years, more than $500, making boys' suits and general sewing. See the new Improvements and Woods' Lock-Stitch Ripper.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notice exceed Four Lines, One Dollar and a Half per Line will be charged.

Patent for Sale, through agents or otherwise. Article for domestic use, of universal application, made by wood-workers. Already tested and of undoubted value. Owner has not time to push it. Address, Useful & Ornamental, Box 3374, P. O., New York.

For Sale, two Patents. Address H. S. Ball, Spartanburg, S.C.

Wanted—A responsible party to manufacture a patent spool holder for Sewing Machines. Machinists who would like to make a contract for the above, can learn particulars by addressing F. A. K., Station A., P. O., New York.

Dobson's Patent Scroll Saws make 1100 strokes per minute. Satisfaction guaranteed. John B. Schenck's Sons, 118 Liberty St., N. Y.

Permanent Photograph Printing, just what is wanted by Manufacturers. Send for Circular to Amer. Photo Relief Printing Co., 1002 Arch St. Philadelphia, Pa. John Carbutt, Sup't.

Valuable Patent Right for Sale. The amusing Toy Attachment for Pianos, illustrated in SCIENTIFIC AMERICAN, October 28th, 1871. Address G. L. Wild & Bro., 420 11th St., Washington, D. C.

Boston Fire! Goodnow & Wightman, 23 Cornhill, were not burned out, and are ready to fill all orders for Tools and Materials. Catalogues were all burned, but will have more in about two weeks.

First Class Steam and Vacuum Gauges, Engine Registers, Davis' Recording Gauges. New York Steam Gauge Co., 46 Cortlandt St., N.Y.

Water Front for Factories, Rope-walks, Lumber-yards, &c.—Lots for Sale or Lease. Blocks of lots on Newtown Creek, near East River, adjoining New York and Brooklyn Cities; prices $300 to $1,000; terms easy. Apply to S. R. Schieffelin, No. 15 East 26th St., New York.

Water Wheel Regulators—warranted, or no sale. Address F. B. Bowen, Pawtucket, R. I.

Soluble Glass, Water Glass, Liquid Quartz, Silicates of Soda and Potash for Concrete Cements, Fire and Waterproofing, manufactured by L. & J. W. Feuchtwanger, Chemists, 55 Cedar St., New York.

Oxide of Manganese, highest test, from our own mines, for Steel manufacturing, Patent Dryer, Paints and Glass, at lowest prices, by L. & J. W. Feuchtwanger, 55 Cedar St., New York.

Nickel Salts, double Sulph. and Ammonia, especially manufactured for Nickel Plating, by L. & J. W. Feuchtwanger, Chemists, 55 Cedar St., New York.

Dickinson's Patent Shaped Diamond Carbon Points and Adjustable Holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24 and Nov. 20, 1869. 64 Nassau St., New York.

Wanted—A Small New or Second Hand Iron Planer for light work. Apply to J. H. Killey & Co., Hamilton, Ont.

Four Brick Machines, Combined with Steam Power (Winn' patent), makes 40 M. per day, for sale at a bargain. Address the manufacturers, John Cooper and Co., Mount Vernon, Ohio.

Absolutely the best protection against Fire—Babcock Extinguisher. F. W. Farwell, Secretary, 407 Broadway, New York.

Hydraulic Jacks and Presses—Second Hand Plug Tobacco Machinery. Address E. Lyon, 470 Grand St., New York.

Steel Castings "To Pattern," from ten pounds upward, can be forged and tempered. Address Collins & Co., No. 212 Water St., N. Y.

Heydrick's Traction Engine and Steam Plow, capable of ascending grades of 1 foot in 3 with perfect ease. The Patent Right for the Southern States for sale. Address W.H.H.Heydrick, Chestnut Hill, Phila.

The Berryman Steam Trap excels all others. The best is always the cheapest. Address I. B. Davis & Co., Hartford, Conn.

Wanted—Copper, Brass, Tea Lead, and Turnings from all parts of the United States and Canada. Duplaine & Reeves, 760 South Broad Street, Philadelphia, Pa.

The Berryman Heater and Regulator for Steam Boilers—No one using Steam Boilers can afford to be without them. I. B. Davis & Co.

T. R. Bailey & Vail, Lockport, N. Y., Manf. Gauge Lathes.

Windmills: Get the best. A.P.Brown & Co., 61 Park Place, N.Y.

The Berryman Manuf. Co. make a specialty of the economy and safety in working Steam Boilers. I. B. Davis & Co., Hartford, Conn.

Williamson's Road Steamer and Steam Plow, with Rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1809.

Peck's Patent Drop Press. For circulars, address the sole manufacturers, Milo, Peck & Co., New Haven, Conn.

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Boynton's Lightning Saws. The genuine $500 challenge Will cut five times as fast as an ax. A six foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

For Steam Fire Engines, address R. G. Gould, Newark, N. J.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W.D. Andrews & Bro. 414 Water st. N.Y.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

Presses, Dies & all can tools. Ferracute Mch. Wks, Bridgeton, N.J. Also 2-Spindle axial Drills, for Castors, Screw and Trunk Pulleys, &c.

Gear Wheels for Models. Illustrated Price List free. Also Materials of all kinds. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

Machinists; Illustrated Catalogue of all kinds of small Tools and Materials sent free. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

Gatling guns, that fire 400 shots per minute, with a range of over 1,000 yards, and which weigh only 125 pounds, are now being made at Colt's Armory, Hartford, Conn.

Perfection—Patent Ears for Elliptic Spring Heads. Address George P. Cleaves, Concord, N. H.

A New Machine for boring Pulleys, Gears, Spiders, etc. etc. No limit to capacity. T. R. Bailey & Vail, Lockport, N. Y.

Winans' Boiler Powder, 11 Wall St., New York. Certain cure for Incrustations—17 years best in the market.

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Notes and Queries

[We herewith present a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—Will some one please inform me how small birds are stuffed, and what is used?—A. A. O.

2.—Why do steam boiler plates crystallize over the fire, while feeding the furnace in front has a tendency to harden the iron?—B. F. M., of Ohio.

3.—How can I remove stains of blood or oil from the feathers of stuffed birds?—W. R. F.

4.—What properties are essential or indispensable in a soil or clay for making good brick?—H. C.

5.—Will some one give me directions to make a telescope for my rifle? The distance between the center of dovetail on front end and the rear peep sight is 29¼ inches.—C. E. R.

6.—If a tube of 36 inches hight from its base, and an inch in diameter and graduated in a hundred parts, stands at zero in still water, how high will the water rise in the tube if placed in a stream of water running at the rate of 12 miles an hour?—S.

7.—What articles are used and what is the proportion of each, in the composition of the white powder used for stamping with perforated patterns for braiding and embroidery? What is the paper or parchment used for making perforated patterns? What kind of machine is used for perforating?—J. M.

8.—I recently made a Leyden jar, by coating a two quart candy jar in the usual manner. I could not charge it; and when I insulated it and charged it through the knob, electric sparks could be drawn from the outer coating. I tried another jar of the same kind, with a similar result. Is it possible that the electricity could pass through the glass, and is some glass permeable by electricity? I have other jars which work well.—N. E. F.

9.—Upon what part of the face of a 4 feet mill stone, weighing 1,500 lbs. and running at a velocity of 180 revolutions per minute, will the least amount of power grind a given amount of grain in an hour, and what is the proportioned amount of resistance to the power at 12 inches, 18 inches, and 24 inches respectively from the center?—G. B. R.

10.—Will some one tell me if there is anything which will remove fly specks and other soils from gilt picture frames without also removing the gold? Is there any way of cleaning the light bronze gas fixtures without injuring the bronze? Can white window shades be done up with the same gloss and stiffness as when new?—F. E. V. E.

Answers to Correspondents

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1·50 a line, under the head of "Business and Personal."

ALL references to back numbers must be by volume and page.

C. T. W., of N. Y., will find good recipes for preventing rust on and browning gun barrels on pages 154 and 266 of our volume XXVI.

J. R. S., of Mass., will find elaborate directions, with an illustration, for constructing cone pulleys, on page 100 of our volume XXV.

A Subscriber will find directions for building an ice house on page 130 of our volume XXV.

Will you or any one inform me if there is any method by which magnetism can be permanently retained in a piece of steel: or, in other words, is there any such thing as permanent magnetism; and at the same time mention, if it can be done, where I could get steel so magnetized?—J. P. Answer: Any magnetized piece of steel will retain its magnetism permanently. Any philosophical instrument maker will do the work for you. You can do the work yourself by rubbing the piece of steel with one of the poles of a common horseshoe magnet.

F. O. B., of Ill., says: I would like to enquire whether air compressed into a vessel and allowed to cool to the temperature of the surrounding air loses any of its pressure in cooling. Also, if allowed to escape when cooled, into another vessel, it will lower in temperature to correspond to a reduction in temperature. Answer: Yes. Compressed warm air is reduced in pressure by cooling. Within certain limits of temperature and pressure, air expands 1-491 of its volume for every degree of Fahr., of increased temperature and contracts accordingly by cooling. Contraction of volume of course reduces the pressure. Air under compression, when allowed to escape, is by its expansion reduced in temperature.

W. P. H. sends a diagram of a method of spacing a horizontal line into equal divisions, thinking that it is a new and quick method. By reference to Euclid, he will find that the method is not new.

J. H. S.—The mineral you send is calcite or carbonate of lime, and similar to coarse granular marble.

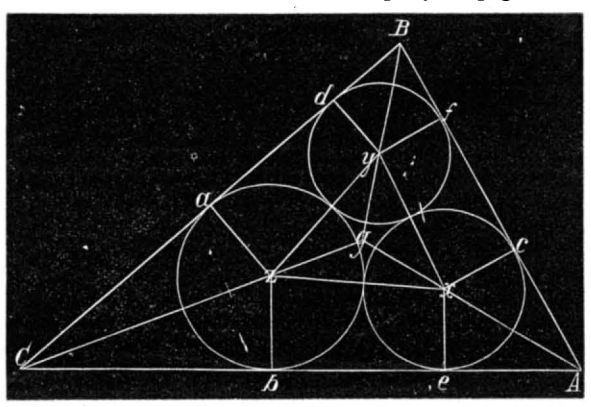
F. D. H. asks: How can I prepare bladders to be used as gas bags, rendering them soft and pliable? Answer: Try a little glycerin.

D. G. N., of Ark., will find the best method to run a 12 horse power engine to saw logs to be as follows: Belt direct from a six foot balance wheel to the saw pulley, which should be of 18 inches diameter; govern the steam by a butterfly valve by hand, shutting off steam just as the saw gets out the log; drill a ⅛ inch hole in the valve, which will just keep the engine moving, feed ½ to 1 inch at each revolution of the saw, and let it run as fast as the engine will carry it. I once sawed 5,000 feet per day, for 40 working days in succession, in this manner. But he must have a good foundation, as the engine will run 250 revolutions at times, with a 4 foot saw. We burned the saw dust as fast as made, but we had a 30 horse power boiler to an 8 inch cylinder engine, using steam at 80 lbs. We also did well with an 8 inch cylinder portable, with two boilers.—C. E. G. of Conn.

What is the reason that the old fashioned long stroke engines are all laid by, in places where they use stationary engines?—H. R. H. Answer: The reason why the high speed engines are preferred is because they develope more power from the same quantity of fuel, than the old fashioned engines. The theory is that the piston and rod, cross head and other reciprocating parts, if they have a high speed, act upon the principle of the fly wheel, absorbing the force of the steam at the commencement, and giving it at the end of the stroke. The practical effect is to do away with the unequal steam pressure experienced in ordinary engines, securing in lieu thereof a uniform rotative pressure on the crank. The strain on each dead center is avoided in the high speed engine, and a uniform smoothness of running is attained. In a competitive trial in England not long ago, of two engines with cylinders of the same size, using the same weight of steam per horse power per hour, the high speed engine developed 43 per cent more horse power than its low speeded competitor.

At what angle should a drill, to go the quickest speed through cast iron, be made? Will the same angle be the best for drilling wrought iron and steel?—C. E. G. Answer: for cast iron the cutting edge of the drill, should be on an angle of twenty to twenty-five degrees; for wrought iron the drill should be sharper. The cutting angle to be used is varied with the quality of the metal.

GEOMETRICAL PROBLEM.—To J. S. E., query 7, page 298.—



Let A, B, C, be any triangle, the sides of which being known, the angles may be found in the usual manner. From g, the center of gravity, draw lines bisecting the angles. Let x, y, z, be the centers of the circles. From x, y, and z, let fall upon the sides AB, BC, CA, the perpendiculars, xc, yf, yd, za, zb, xe. Join xy, yx, zx. Then,

AB equals Ac plus cf plus fB. (1.)
BC equals Bd plus da plus aC. (2.)
CA equals Cb plus be plus eA. (3.)

$$Ac = cx \tan.\frac{A}{2},\ cf = \left((yx)^2-(cx-fy)^2\right)^{\frac{1}{2}},\ fB = yf \tan.\frac{B}{2}.$$

Substituting these values in equation 1, we have an equation in which the side A B is given in terms of the perpendiculars cx, yf. In like manner from equations 2 and 3 will result equations giving the values of BC and and CA in terms of dy, az and zb, xe. From these the value of Ax, By and Cz are easily obtained. J. S. E. can solve the problem thus indicated, taking care to use the table of natural tangents, etc., at his leisure.—H. F., of Ind.

M. S. of Va.—The mineral you send is asbestos. We believe the market is rather overstocked with the article at present.

What is the best way to rid a cistern of worms? The water is used for cooking purposes, and the worms are a source of great annoyance.—A READER. Answer: Tell us how your cistern is supplied and located, and what sort of worms you are troubled with.

Will you please inform me if there is an apparatus for producing light from electricity to take the place of gas?—G, E. B. Answer: Yes. The electric light is extensively used in England for lighthouses; but in this country it is not employed very much. The lecture rooms of some of the colleges have them. The electric light is expensive as compared with gas.

Has there ever been laid in this country a roadway pavement of the Scrimshaw or Abbott's concrete patent (or any other coal tar pavement) which has proved a success?—R. E. M. Answer. Yes. Such roads, properly made, are excellent. You will see examples of them in New York and Brooklyn. They are used quite extensively in the latter city,

Can your correspondent E. H., or some one else, tell me how to make good cider? I especially want directions for treatment after the cider leaves the press, and for preserving it by bottling or other means.—J. W. B. Answer: By placing a little of Professor Horsford's neutral sulphite of lime in the barrel, you can at once arrest fermentation at any point you wish, and keep your cider sweet for any desired length of time.

Please give me the figures for finding the capacity of a boiler which is 15 feet long, 4 feet diameter, and contains 30 four inch flues, and also the number of gallons of its capacity. Also the name and composition of the enclosed specimen of rock (rather poor) which was sent to me from some part of Baltimore county, Maryland.—I. P. H. Answer: The contents of the boiler, space occupied by flues deducted, will be about 975 gallons. To compute the volume of a cylinder multiply the area of base by the length. To compute the area of a circle multiply half the circumference by half the diameter. The mineral you send is asbestos.

What is carboline gas? In what manner is it produced, and how is it used?—A. S. Answer. We do not know of any such gas.

C. C. A., of Cleveland, asks: What galvanic battery is the best for all general use? Answer: The kind used at the telegraph office in your city.

W. R. H., of Ill., says:—We are preparing to build a church house in our vicinity forty-four feet long. What should be its width and hight to render it easy and agreeable both to the speaker and hearer? Answer: The width should be 30 feet and the hight 20 feet to the eaves and 20 feet more to the ridge. Lath and plaster on the under side of the rafters, making your ceiling the same pitch as your roof without any arch to the ceiling; then break it up by showing the principal trusses (three in number) extending across the roof. It is best to make these simply to consist of the two rafters and a short hammer beam at bottom on each side, and, in the absence of buttresses, connect these by a 1¼ inch iron tie rod. At the center of each tie rod, bring a rod down from the ridge to support the chandeliers, with an ornament at the intersection of the two.

Fig. 1.

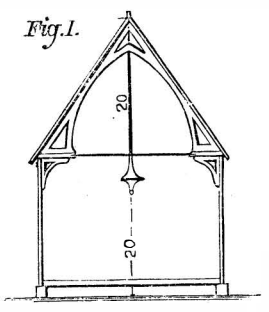
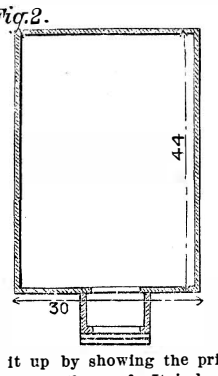


Fig. 2.



How can I cheaply obscure the window glass, to make it appear like ground glass?—L. Answer: Use a ball of putty and dab the glass.

W. P. says:—I send you a specimen of mineral; will you please say what it is, and its value? Answer: The incrustation on the stone is iron pyrites, of no value unless found in large quantities.

Can I coat a small part of a tin roof, that is leaky, with any thing to keep out the water for a few months, and if so, what?—L. Answer: Cover the cracks with rags dipped in melted asphaltum.

I want to make a marine aquarium. Can I compound a sea water that will do?—L. Answer: Probably not. But you can try. Ordinary sea water contains eight or nine different salts besides chloride of sonium. For quantities, consult any good chemistry.

Will you or some of your many readers inform me the origin and nature of the smoke of Indian summer? Also, is there a paper devoted exclusively to poetry; if so, where is it published?—W. S. H. In the fall of the year the burning of leaves, brush wood, and grasses loads the air, in some localities, with smoke, which in calm weather remains suspended in the atmosphere for some time. The ordinary blue haze, seen in the distance, is supposed to be due in part to the presence of minute particles of matter floating in the air, and in part to watery vapor suspended in the air.—We believe there is no paper published that is wholly devoted to poetry. But such a publication might be made a success, especially if it were wholly produced in verse. Such a paper would be in journalism somewhat like the opera in theatrical representation.

G. P. says:—Will you please inform me what is the fastest running time (well authenticated) ever made on any railroad in this country or in Europe? Answer: One of the fastest railway train records in this country is that of the special relief train, carrying men and steamers, which ran from Worcester, Mass., to Boston, November 10, 1872, during the recent conflagration. Distance 44 miles; time of run 45 minutes, being at the rate of over 63½ seconds per mile, or over 56½ miles per hour. It is probable that portions of the distance were made at a considerable faster rate of speed than the above, and other portions at less speed. A velocity of sixty miles an hour is often obtained on first class railways on straight portions of the track.

A. D. B. says:—The reservoir at the top of my house receives the water from Wenham Pond. My plumber declares that it would not be safe to apply a ball cock to the supply pipe, as he fears that the pipe would not stand the pressure. Does it not have to bear just as great a pressure with the arrangement the plumber has put in, namely, a cock in the lower story, which is opened by hand, and closed when a telltale pipe shows that the reservoir is full? Answer: The pressure in water pipes varies with the hight of the supply. If your house reservoir, supplied by cock, as stated, is 34 feet above the ground, the greatest pressure in your water pipes, at the surface of the ground, will not exceed 15 lbs. to the square inch. If Wenham Pond is 340 feet above your ground, then the pipe leading through your house up to the ball and cock at the reservoir would have to resist a pressure of nearly 150 lbs. to the square inch. So great a pressure in a dwelling house is not desirable, as the pipes, unless made of unusual strength, are likely to leak and do mischief. It is to avoid risk of leakage under high pressure, and consequent damage, that your plumber has put in the cock down stairs.

H. A. H. G., of S. C., says:—I enclose you a specimen of something, I don't know what; it is found tolerably plentiful a few miles from this place. You will do me a favor by answering what you think it is. Answer: The mineral is black tourmaline, of no use in the arts.

To F. A. S., query 17, page 314.—Get the regular transfer pictures, then cover the picture with a slight coating of varnish; let it stand 10 or 15 minutes, put your picture on the glass or wood, rubbing it gently so that the air is all pressed out, let it "set" a few minutes; then sponge it off nicely with water, taking care to let your paper get thoroughly wet, then raise the paper gently; when dry, varnish with finishing varnish.—A. A. O., of Iowa.

In answer to your correspondent from Tennessee, mentioned in your editorial on page 295, I will say that there are moments when a quantity of water is instantly converted into steam. If much steam escapes, the disturbance in the boiler mixes the water and steam, so that the water becomes instantly evaporated. This stirs up the mud in the boiler, as is frequently seen on trying the gage cocks. I believe this is the cause of many explosions.—F. B. C., of N. Y.

W. E. F., query 2, page 298, will find the following mixture to be the best lasting and cheapest wash paint for the preservation of shingles: Take two pecks of the best unslaked lime; slake it with boiling water, keeping it covered during the process. Strain the liquid through a fine sieve, and add to it one peck of salt dissolved in warm water, three pounds rice flour, boiled to a thin paste, stirred in boiling hot, one half pound powdered whiting, and one pound glue, well soaked and dissolved in a water bath. Add five gallons of hot water to the whole mixture and let it stand a few days; heat and apply it while hot.—F. S. B., of Me.

P., query 11, page 249, should use pulverized alum and saltpeter, in about equal parts, as a substitute for arsenic. By experience I find oakum superior to cotton or hemp in stuffing, as the tar it contains tends much to the preservation of the skin.—W. R. F., of Mass.

To J. W. S., query 13, page 314.—Silk is generally used, and is, I believe, the best material.—F. S. B., of Me.

J. F. S., query 29, page 314, can make litmus paper by taking 1 oz. litmus, 5 ozs. alcohol, 5 ozs. water. Put them in a ten ounce bottle, and shake them occasionally during five or six days, when a deep blue tincture will be obtained. Pour off the clear fluid into another bottle. To prepare the paper, pour a little in a plate, pass blotting paper through it in sheets, and hang it up to dry. This is for the acid test. For alkalies, take some litmus paper, pass it through weak vinegar, hang it up and let it dry. This is a very delicate test. Another test paper can be made by taking 1 oz. powdered turmeric wood, 5 oz. alcohol, 5 oz. water; prepared as the litmus paper.—W. M. F., of N. J.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

LEATHER CUTTING TOOL,—John Sweezy, Elizabethville, Pa.—This invention has for its object to furnish an improved tool for cutting strips of leather for fly nets and for other uses, which will cut four, more or less, strips at a time, and will cut them equally true from a side of leather or other irregular piece as from straight pieces, and whether the leather be the thinnest morocco or leather three sixteenths of an inch thick; and it consists in the arrangement of the adjustable gage plate, and in the combination of a spring guard with the knife block and cup block formed on the respective handles of the instrument.

FEED WATER HEATER.—Nathaniel Jones, Buffalo, N. Y.—This invention relates to the class of feed water heaters consisting, in general terms, of a series of pans or troughs arranged with a series of heat radiators within a case, so that the water in flowing downward falls from the first series of troughs on to the radiators next below them, and from the radiators on to the troughs in the next series, thus alternating till the final receptacle is reached. The invention has for its object to furnish a heater in which the water pans and steam and water guides are arranged to secure the speediest utilization of a given amount of heat with the least complicated and expensive construction of the apparatus.

FOLDING BEDSTEAD.—H. Harrison Hill, Pontiac, Ill.—The invention relates to bedsteads that fold together by having the rails hinged to the head and foot and the slats pivoted to the rails; and it consists in vertical cleats on the inside ends of rails to strengthen rails and give sufficient thickness for one leaf of hinge.

LAMP CHIMNEY PROTECTOR.—Edward Stern and Sigmund Blau, New York city.—This invention consists in a lamp chimney protector, consisting of two bars pivoted together at one end and provided with hooks at the other, so as to be adapted to use in chimneys of varying size.

ORE SEPARATOR.—Johann Friedrich Utsch, of Iserlohn, Germany.—This invention relates to a new self-acting jig machine, in which separate chambers, having separate discharge openings at varying hights, are arranged for the reception of the several kinds of ore, salts, or other material which are to be separated from one another by virtue of their varying specific gravity. By having the said chambers so united as to permit a free flow of the ore from one to another, the process of separation is greatly facilitated, and the separation carried on with greater certainty than in the jig machines now in use.

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PEGGING JACK.—John G. Ziegler, Salt River, Mich.—This invention consists of a circular ring or table mounted on a standard by being pivoted to the top of it at one edge, and resting at the opposite edge on braces to which it is pivoted. Said braces are swiveled to the standard so as to swing around it horizontally and be adjusted vertically by controlling nuts screwing up and down on the standard, whereby the said ring or table, whereon the blocks to which the last is clamped are mounted,can be readily adjusted to any required angle to the horizontal plane. The invention also consists of the attachment of the last-supporting blocks to this ring or table by a long slotted plate, which is secured through the table, so that it can turn freely thereon, the said slotted plate being capable of shifting endwise along the bolt by which it is secured, which passes through the slot, so that the last can be oscillated horizontally on the table, and shifted transversely thereof to facilitate the adjustment of the work to any position.

IRON STRUCTURE.—Joseph D. Duclos, New York city.—This invention has for its object to simplify the construction of iron buildings by dispensing with the "backing up" or covering of the walls on the inner sides thereof. The invention consists in finishing the cast metal walls of such structures on both sides with panels, ornaments, or otherwise, and in thereby making the inner backing up, by means of plaster or other devices, entirely unnecessary. The cost of putting up iron buildings is thus greatly reduced.

DENTIST'S AND BARBER'S CHAIR.—Francis J. Coates, Cincinnati, Ohio.—This invention consists of certain arrangements of apparatus for supporting the seat and shifting it on a horizontal pivot laterally, also forward and back, and raising and lowering the seat. It also consists in the construction of such chairs with perforated covers to the seats and backs for ventilation. Thus constructed, the seat and back will be kept moderately cool instead of becoming and remaining unpleasantly heated when in use.

WASHING MACHINE.—William W. Grant, Bloomington, Ill.—This invention has for its object to furnish an improved washing machine. It consists of a rectangular suds box, made with a concave bottom and concave vibratory back, so arranged as to swing down to allow the water to flow back into the suds box when a wringer is being used. It contains a corrugated beater board, actuated by a standard and lever passing through notches in the cover.

BUGGY REACH.—John W. Reeder, West Manchester, Ohio.—This invention has for its object to furnish an improved reach for buggies and other vehicles, which shall be so constructed that one of the wheels may rise in passing over obstructions without twisting the reach, splitting the headblock, breaking the braces, or straining or otherwise injuring the reach or its connections.

BOOK HOLDER.—David Moritz, Carmansville, and Robert White, Mott Haven, N. Y.—This invention relates to a new strap or holder for books, being intended for children's use while carrying their books to and from school, and for similar purposes. The invention consists in the combination of a spring slide with a perforated guide and with the fastening string, all operating in such manner that the string drawn through slide and guide will be clasped and held secured by the action of the spring.

MODE OF PROPELLING CANAL BOATS.—Joseph Hough, of Buckingham, Pa.—This invention relates to a new apparatus for propelling ships and boats and for preventing, to the greatest practicable extent, the lateral disturbance of the water. The invention consists, first, in the use of a double propeller, composed of two wheels, that revolve in opposite directions but effect the same results by having their wings inclined in opposite directions. The invention consists, also, in the use, at the sides of the vessel, of laterally adjustable plates, which serve to absorb the lateral disturbance of water and thereby prevent all injury to the banks or shores of any water course in which the vessel may be used.

PAINT MILL.—Robert J. McGrew, Evansville, Ind., assignor to himself and George W. Shanklin, of same place.—This invention consists in an arrangement of the furrows or grooves of stationary or movable conical grinders, calculated to be efficient in performing work and to be self-sharpening. Second, it consists in a construction and arrangement of both the grinders, so that they can be readily taken off when worn out and new ones applied without any unnecessary waste of parts not worn out. Third, it consists in an arrangement of the connecting devices by which the bridge or top frame is connected to the hopper to facilitate the removal of the rotating grinder. Fourth, it consists of an arrangement of devices for suspending and adjusting the rotary grinder. Fifth, it consists of an arrangement of grooves in the shell to answer the purpose of an ordinary scrape for the discharge of the ground paint.

BORING MACHINE.—William C. Freeman, Louisiana, Mo.—This invention consists of one or more gangs of boring tools arranged on a vertically adjustable support and provided with driving belts for the tools and apparatus for raising and lowering the tools while in operation, with automatic feeding gear, a hopper, guides, and holder for the stuff to be bored, all arranged so that the feeder pushes a board from the bottom of the hopper along the guides to the holder over the gangs of boring tools, which then come up and bore the board along one or both edges at the same time that the feeder goes back for another board, and then go down before the feeder comes forward again with the next board and ejects the first by the next, and so on. The hopper, guides, holder, and the tools are adjustable to boards of different sizes.

LEATHER BOARDING AND GRAINING MACHINE.—Louis Townsend, Terre Haute, Ind.—This invention has for its object to furnish an improved machine for boarding and graining leather, doing its work quicker and better than it can be done by hand, and with substantially the effect of hand boarding upon the leather. By suitable construction the upper boarding and graining roller can be raised for the convenient insertion of the leather without disarranging the gearing. The frame is held down to hold the upper roller down upon the lower roller by a spring. Levers are provided, the outer ends of which are connected by a cross bar which serves as a foot lever or treadle for operating said levers. The inner ends of the levers are pivoted to the lower parts of the sliding bars or frame and also to the frame of the machine. A roller is attached, made somewhat smaller than the boarding and graining rollers, so as to enter the space between the forward sides, and hold the leather firmly against them. In using the machine the outer ends of the levers are pressed down, which raises the frame and upper roller and operates another lever to throw back the small roller and blade. The leather is then passed between the rollers and the blade, and as the levers are released the spring forces the frame and roller down, which operates the second levers to throw the blade and roller forward, the blade folding or doubling the leather, and the small roller holding it firmly against the graining rollers. If, now, the machine is started, certain rollers will draw the leather inward and other rollers will draw it outward, while the blade will keep it doubled or folded and pressed in between the graining rollers, the fold of the leather constantly changing its place, and the same effect being produced as is produced by hand boarding and graining, and doing it quicker and better.

SASH BALANCE.—Herman Gross, Hoboken, N. J.—The invention consists in a screw passing through a nut at the meeting rail and spring at one end, all arranged on the inside of window frame, and so adjusted that the tension of the spring tends to turn the screw in the direction to raise the sash with just sufficient power to balance or hold the sash wherever it may be, so that the latter can be moved up or down with but a slight application of force, the same as when balanced by a cord and weight or other balancing contrivance.

BUGGY, FARM AND LUMBER WAGON.—Chesley Jarnagin, Beans Station, Tenn.—The invention consists in a peculiar mode of arranging the seat so that it will be out of the way of any load that may be carried, and so that the driver may never be inconvenienced by the load, and thereby incapacitated from a faithful attention to his business; also in a stone body of peculiar construction and adaptation; and also in a new mode of graduating the load upon a stone body.

HAY OR GRAIN RACK.—Chesley Jarnagin, Beans Station, Tenn.—The invention consists in a lower frame for hay racks, which projects forward and rests upon a platform of the running gear; in a shield or fender by which all forward movement of the load in going down hill, and all inconvenience from the same to the driver, is entirely prevented; and also in a folding curtain fastened to said shield and attached to an end pivoted to a bow, to shelter the driver from the effects of the direct rays of the sun.

MANUFACTURE OF BROMINE.—Herman Lerner, Mason City, and Elijah C. Harpold, Hartford City, W. Va.—The invention consists in making the bitter water pan with a close cover so as to form a boiler, and in connecting its steam space with the stills, whereby the vaporized bitter water may be utilized for the agitation of the liquid therein. It also consists in connecting this boiler with a primary reservoir, which is thereby kept at a proper temperature, and a large proportion of the salt precipitated. It also consists in connecting the furnace with a secondary reservoir, whereby the latter may be always maintained at the desired temperature, and thereby precipitate nearly all the residue of salt.

COTTON CULTIVATOR.—William Brooks, Lexington, Ga.—This invention relates to a cultivator for cotton and other crops, etc., and it consists in the combination, with an ordinary single shovel plow, of a pair of horizontal curved wings, which are attached loosely to the heel of the shovel standard by means of a single fulcrum bolt, to enable said wings to adjust themselves to the surface of the ground.

BLIND SLAT ADJUSTER.—Oliver L. Houghton, Holden, Mo.—This invention consists of a coiled spring connected to one of the slats for turning them up all the slats being connected together with a ratchet disk on the lower slat, and a catch pivoted on the lower cross piece of the blind to hold the slats open; or, instead of the disk and catch, it is proposed in some cases to have a hasp with a knob hinged to the lower slat, and a catch plate attached to the cross piece below, for pulling the slats down, and fastening them by a pin on the hasp.

EARTH AUGER.—Joseph Wilson,' Cameron,' Mo., assignor to himself and Lewis A. Bing, of same place.—This invention relates to augers for boring wells, and consists of two semicircular tapering pods, each with a cutting lip and opening, securely riveted or fastened to arms. Securely fastened, by brazing or otherwise, to the sides of the shank, are two pairs of cross plates. To the upper pair the ends of the arms are jointed, so that the parts of the pod may be separated when the auger is raised and the inclosed earth may be released. The pods are held together in close contact with each other, so that they form a round hollow cylinder sufficiently tapering to allow it to be revolved in the earth with but little friction. When the auger is full it is withdrawn, the pods are separated, and the earth discharged.

AWNING SLIDE.—John Boyle, New York city.—This invention has for its object to furnish an improved awning slide, retaining its position securely and not being liable to get out of order; and it consists in a grooved slide, sliding block, and the tubular socket to receive the rod.

DRAWER SUPPORT.—John Baggs, Easton, Md.—The invention relates to drawers generally, and consists in providing them with a support, susceptible of easy adjustment to take up wear, prevent sticking, and render the relative position of a drawer to the frame always readily maintainable. It consists, secondly, in beveling the front division piece between drawers, so that the drawer will not rub the veneering and cause it to peel off, but will cease to have a bearing on said division as soon as it is started outwardly, and will not contact with it until the drawer is entirely closed.

ADJUSTABLE CHIMNEY CAP.—Patrick H. Carlin, Brooklyn, assignor to himself and George H. McLaughlin, New York city.—This invention has for its object to produce a metallic chimney cap or covering for the tops of chimneys in place of the blue stone or other stone or brick caps heretofore used, and thereby to increase the strength and durability of chimneys, and reduce the possibility of their crumbling to pieces. The invention consists in the use of a metallic top having adjustable ledges to fit any thickness of walls, and adjustable cross pieces to fit any position of flues.

COOKING VESSEL OR BOILER.—William Y. Thomson, Oyster Bay, N. Y.—This invention has for its object to furnish an improved cover for kettles and other cooking vessels, which shall be so constructed that the liquid contents can be conveniently poured off without danger of spilling the solid contents of the vessel or scalding the hands of the operator. Upon the upper part of the opposite sides of the inner surface of the vessel, and directly opposite the lugs, are attached shoulders or flanges upon which the cover rests. To the inner side of the vessel are attached lugs or pins to keep the cover in place upon the shoulders. The cover is made in the form of two semicircular disks, hinged to each other at their straight edges. To the middle part of one of the semicircular disks is attached the handle by which the cover is handled. In the other semicircular part of the cover are formed a number of perforations, through which the water flows out when the kettle is inclined. The perforated part of the cover is covered with a flap, hinged to the said semicircular dish, so that it may be pushed out by the outflowing liquid. Suitable means are provided so that, by turning the cover one quarter around, it will be locked into place. In pouring off the liquid contents of the vessel, the said vessel is inclined by means of the handle, upon the lower ends of the arms of which are formed straight hooks which enter slots in the lugs formed upon the lower part of the said kettle. This construction enables the handle to be kept from dropping down upon the stove or range and being burned or heated.

CORN PLOW AND MARKER.—George W. Meixell, Hecktown, Pa.—This invention has for its object to furnish an improved machine for furrowing the ground for planting and cultivating. The two beams, to which the standards of the plows are attached,, are connected and held in their proper relative positions by the cross bars, which are secured to the upper sides of the beams so that the plows may be conveniently adjusted wider apart or closer together, as circumstances may require. The rear end of the tongue, which is loosely bolted to the center of the central cross bar, passes through a keeper, which is so formed as to allow the said tongue to have a vertical but no lateral movement. This construction relieves the horses' necks from having to support any weight, and at the same time leaves the plows free to follow the surface of the ground. The depth at which the plows work in the ground is regulated by the gage wheels, which may be readily adjusted. The handles may be inclined, to allow the plowman, while guiding the plows, to walk at the side of the row of plants being cultivated. By suitable construction, the marker may be turned from one side to the other as the machine passes back and forth across the field, working equally well at either side.

MACHINE FOR POLISHING MARBLE AND WOOD.—John C. Mateer, Kankakee, Ill.—This invention has for its object to furnish an improved machine for polishing marble and wood, and which may also be used for operating a bit or drill for boring purposes, doing its work well and thoroughly, and adjusting itself to the surface to be operated upon; and it consists in a vertical shaft, revolving in bearings attached to suitable supports. Upon the upper part of the shaft are placed a fast pulley and a loose pulley to receive the driving belt. A frame is arranged, to the rear ends of the top and bottom bars of which are attached bearings in which the shaft revolves, so that the said frame may be supported by the said shaft. This shaft, by means of a belt, imparts motion to a second shaft attached to the frame. From the second shaft extends another frame, at the end of which is a third shaft, to the lower extremity of which the rubber is fastened and so arranged as to adjust itself to the surface to be operated upon. The swinging frames can be conveniently raised and lowered to adjust them to the thickness of the material to be operated upon.

STEAM ROAD ROLLER.—Thomas Aveling, Rochester, England.—The object of this invention is to construct a light and efficient steam road roller with horizontal boiler. To this end, the construction of the roller is so modified as to avoid the necessity for the heavy framing heretofore employed. In carrying out the invention, the general arrangement of the ordinary traction engine is adopted, converting the driving wheels into rollers, and the space left by these rollers is covered by a pair of front rollers, which serve also as steering wheels. These rollers are made conical or "dished," in order that, on the ground line, they may be close together, while at and above their axle there is space for a vertical shaft standing up from their axle, and which serves as a front support for the boiler. This support is so connected to the shell of the horizontal boiler as to allow of its receiving a slight lateral (as well as an axial) motion, which lateral motion is required to permit of the rollers adjusting themselves to their work. The front rollers are mounted loosely on a dead axle to which is bolted the lower end of the vertical shaft or support. To the extremities of this axle a horizontal forked or saddle piece is attached to receive and act as a guide for the steering chain. The chain passes rearward to a chain wheel, by turning which the steering of the rollers will be effected, their axle being free to swivel and oscillate with the vertical support attached thereto. Mr. Aveling has done more towards developing improvements in this line of invention than any other person. Aveling & Porter manufacture the machines in England, and Mr. W. C. Oastler, 43 Exchange Place, New York city, is the agent for this country.

BRIDGE.—George E. Harding, New York city.—The invention consists in a stiff upper chord of metal or wood, preferably arranged in the form of a double ribbed arch, braced and counterbraced in suitable panels, and rigidly connected at each end with a double lower catenary chord, also braced and counterbraced with vertical tension rods connecting the upper and lower chords.

[OFFICIAL.]

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For which Letters Patent of the United States were granted.

FOR THE WEEK ENDING NOVEMBER 5, 1872, AND EACH BEARING THAT DATE.

SCHEDULE OF PATENT FEES:

On each Caveat	$10
On each Trade-Mark	$25
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$15
On an application for Design (fourteen years)	$30

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Wrench, Q. S. Backus..... 132,789

APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter named.

22,890.—CARPET SWEEPER.—N. B. Pratt. January 22, 1873.
23,990.—MOP HEAD.—L. Taylor. January 29, 1873.
23,034.—FIRE PLUG.—J. L. Lowry. February 5, 1873.

EXTENSIONS GRANTED.

2,036.—FRUIT PRESERVING HOUSES.—B. M. Nyce.
2,038.—PRESERVING FRUIT, ETC.—B. M. Nyce.
4,784.—PRESERVING FRUITS, ETC.—B. M. Nyce.
7,813.—HORSE RAKE.—H. W. Sabins.
21,924.—PATCHING RIFLE BALLS.—L. H. Gibbs.
21,936.—LOCOMOTIVE ENGINE TRUCK.—L. Bissell.
21,952.—CAR SPRING.—P. G. Gardiner.
21,991.—SAFETY STEAM BOILER.—F. Stebbins.
22,049.—RAILROAD CAR WHEEL.—T. C. Ball.

DESIGNS PATENTED.

6,235.—TEA CAN.—J. Britton, Greenpoint, N. Y.
6,236 & 6,237.—FURNITURE.—D. Denyven, Cambridgeport, Mass.
6,238.—COOKING STOVE.—A. J. Gilbert, New York city.
6,239.—PERFUMERY BOTTLE.—F. Storm, Philadelphia, Pa.
6,240.—COOKING STOVE.—I. J. Vincent, Pittston, Pa.
6,241.—COOKING STOVE.—I. J. Vincent, Pittston, Pa.
6,242.—COOKING STOVE.—A. C. Williams, Albany, N. Y.
6,243.—FIRE SET HOLDER.—A. Wunder, New Haven, Conn.

TRADEMARKS REGISTERED.

48.—MEDICINE.—T. Boyce, F. McKenzie, San Francisco, Cal.
1,049.—WHISKY.—F. Chevalier & Co., San Francisco, Cal.
,050.—MUSTARD.—H. C. Hudson & Co., San Francisco, Cal.
,051.—CHAMPAGNE WINE.—Renauld, Francois & Co., New York city.
,05 BRANDY.—Renauld Francois & Co., New York city.

Value of Patents,

AND HOW TO OBTAIN THEM.

Practical Hints to Inventors.

PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent even when the invention is but a small one. Larger inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelow, Colt, Ericsson, Howe, McCormick, Hoe, and others, who have amassed immense fortunes from their inventions, are well known. And there are thousands of others who have realized large sums from their patents.

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This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

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In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these, with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

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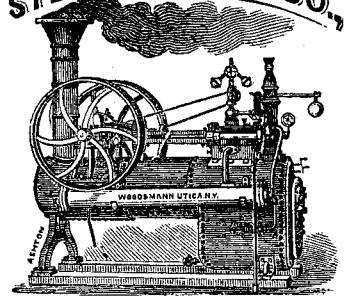

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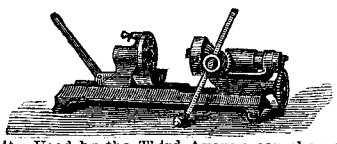

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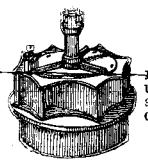

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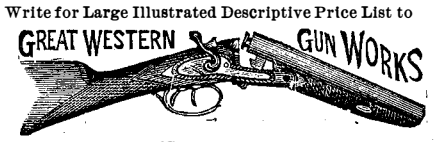

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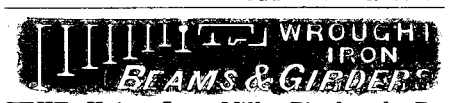

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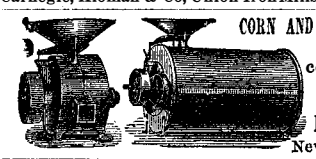

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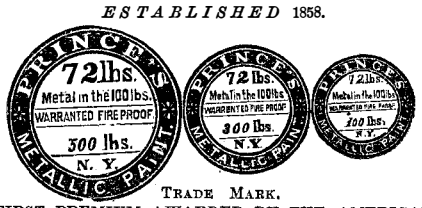

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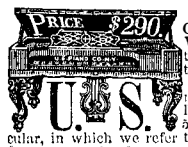

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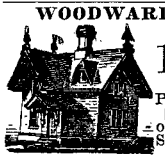

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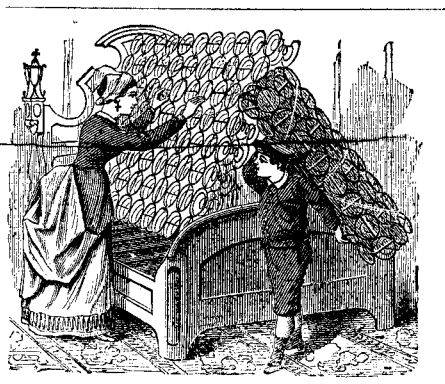

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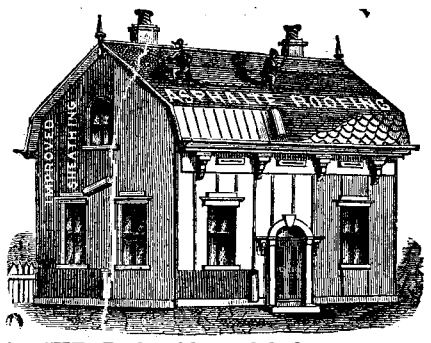

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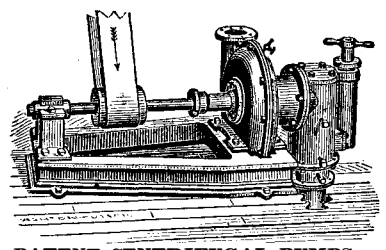

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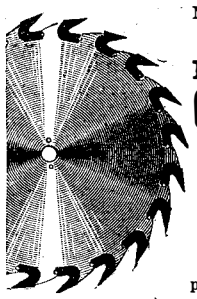

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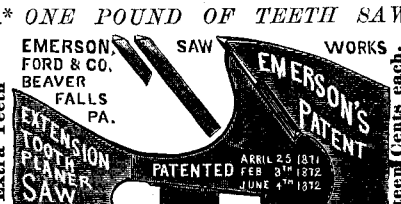
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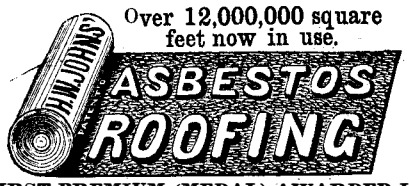

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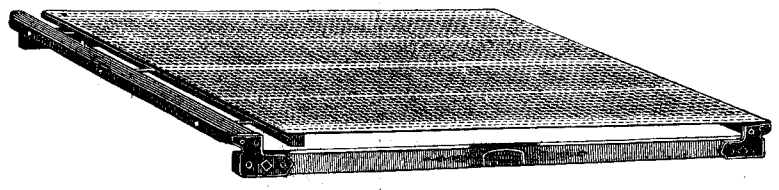

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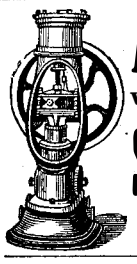

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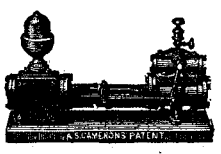

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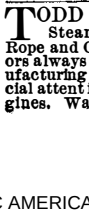

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